CAPITAL FORMATION IN THE PETROLEUM ~~OIL~~ INDUSTRY IN IRAN:

~~PRODUCING AND REFINING~~ 1954-197~~2~~3

BY

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Capital Formation in the Oil Industry in Iran: Producing and Refining 1954-1975.

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ABSTRACT

As a step towards a rigorous study of capital formation in Iranian economy, this study is concerned with the detailed measurement of capital stock in the oil industry in Iran. The study is an empirical one in that it is based on the item-by-item examination of investment flows and presents disaggregated series of capital stock according to types of capital goods.

The first two chapters comprise an attempt to put the study on the context of Iranian oil industry and to examine the framework of investment-decision-makings.

Chapters three - five deal with the technical problems involved in defining, classifying, deflating and accounting for depreciation and obsolescence. Chapter six treats the problems in determining zero-year-stocks and presents both investment-flow and stocks-flow series in formats (92 Tables) which suggest structural and temporal composition of the stocks.

The material thus provided, opens up new areas for investigation and analyses. And Chapter seven points at one such area of investigation by trying to explain the increased-output-per-unit of-input, which is not explained by the availability of labour-per-unit-of-output and/or capital per-unit-of-output. The analysis establishes that capital has been deeply re-structured in favour of the more technology-intensive infra-structural components. It also shows a constant technical bias in capital-labour substitution. Finally a technology index (A(t)) is constructed in order to determine the share-in-concrete-production of combined inputs of-zero-year-quality vis-a-vis that of modern technical embodiments.

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To my countrymen
whose sufferings
I have witnessed
and shared all my life.

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PART ONE

CHAPTER I

BACKGROUND TO THE OIL AGREEMENT OF 1954

In order to throw some light on the context in which the Oil Agreement of 1954 was conceived, this chapter purports a) to cast a cautious glance, through certain indicators, at the economic performance of Persia by the turn of the century (Section 1), b) to depict a summary picture of some of the main features of international oil industry (Section 2), c) to forward an explanation of the main lines of evolution of the pricing system prevalent in the world oil industry (Section 3), and d) to account for certain salient points in the fifty-year history of concessionary agreements as an immediate background (Section 4).

I.1. By the turn of the century Iran was, mainly, a non-industrial society, ranging in stratification from wide, dispersed, pastoral 'paterno-feudalistic' communities to hierarchies of power. Resource and products markets were far from 'free' and nationally integrated. The distribution of wealth and power was extremely polarized and outbreaks of famines were by no means rare.[1]

Population was estimated at about ten million, the distribution of which was overwhelmingly determined by

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1. See Curzon, Persia and the Persian Question, two vols., London, 1892.

the availability of water.[1] The mean age was 25 years and life-expectancy did not exceed 30, while the population had an average growth rate of 0.75 per cent. Almost one out of five of the total inhabited urban areas (that is: 24% in 3 cities, 21% in 7, and 45% in 90 towns), while well above half the population lived in 15,200 villages and hamlets and a quarter of the whole lived a nomadic life.

Migration was marginal and that between the rural areas mostly caused by famines, droughts or feuds. Labour was predominantly unskilled and the remuneration, mainly in kind, did not exceed the 'accepted' level of subsistence. Illiteracy marked up to 95 per cent, and nutrition per capita was estimated at 50 lb/month of wheat consumption. Some one million people lived in Russia and Caucasian oil fields as unskilled labour, and minimally as businessmen.

The Gross Domestic Fixed Capital Formation is estimated at about 300 million Krans (one Kran equalled 4.5 pence in 1900), consisting of 98% indigenous and 2% imported goods, 47% of the total being constituted by rural and urban housing. The economy is thought to have had a growth rate of 0.5 per cent (1900-8).

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1. By retrogression from the 1956 census, Julian Bharier concluded the figure 9.86 million in his Economic Development in Iran 1900-1970. The figures in this section draw upon his studies both in the book and his unpublished thesis, Capital Formation in Iran, University of London, 1965, unless otherwise stated.

Private consumption expenditure is estimated at 3.1 thousand million Krans and government expenditure at K. 67 million, only about 2% of the GNP. 43% of this expenditure went to the army, 24% to pensions, 13% to the royal family and 7% to the all-country administration. This government expenditure was financed from various sources, 25% from customs, 8% from monopolies and 60-65% from taxes and gifts.

The single most important factor determining economic structure was the occupational pattern of labour distribution. Almost 80 to 90 per cent of employment was in agriculture, under a system of latifundia of the crown, absentee lords, and vagf (religious trusts). Fishing in the Gulf, leased to Russians, brought 850,000 Krans yearly; and in the North it was a non-industry, a spare-time hobby. The forestry - some 20 million hectares - was a Greek monopoly, and the total mining output estimated at about three million Krans per year, was leased for 800,000 Krans.

Industry, mainly consisting of small manufactures, cottage industries and handicraft, relied entirely on manpower and animal, since steam power was virtually nonexistent. Markets were generally insulated from one another mostly because of low demand, simple homogeneity of goods, and the lack of communication and transportation system.

There were only 800 miles of roads of which 227 were built and controlled by the Russians, 160 by the British, 280 by the Bakhtiari chieftains, and only 120 by the government. The only means of transportation was animal. Freight was very high and in the case of imported goods it amounted to some 40% of the final price. There were 8 miles of railroads, and the waterways were restricted to a few miles on River Karun and Lake Rezaieyeh, the latter being normally leased for some 13,000 Krans annually. Ports were limited to four, in the Persian Gulf, with 450,000 ton/year capacity, 88% of which were British goods.

Customs was almost non-existent. Imports amounted to 255 million Krans of which 1% was capital goods, 60% manufactured consumer goods, 29% foodstuffs, 3% kerosene, 4% raw materials and 3% tobacco, as against the export of 147 million Krans consisting of raw vegetables 50%, raw animal products 25% and manufactured goods 25%. The balance was more or less struck by invisible incomes. The main trade partners were Russians (45%), British (34%), Turkey and France (7% each).

National currency was silver-based, which declined in external value since 1875 (9.06 - 4.57 pence = 1 Kran), the main reasons for its devaluation being: a) depreciation of silver-gold parity and b) adverse balance of payments. There were two banks in the country: The Imperial Bank and Banque de Prête. The former was British and enjoyed exclusive rights of issuing notes, and had eight branches in the country. The latter was Russian loan bank and had three branches. A second

Russian bank was founded by the turn of the century. All the rest of the financial operations rested in the hands of the traditional sarrafs, usurers.

I.2. In contrast, industrialized European countries had evolved into some reasonable degree of social integration via strong social and economic institutions. One could conceivably talk of national market integration for both factors and products. The corporation had emerged and was evolving as the organizational embodiment of social productive resources. From a mere offspring of early owner-manager enterprises, they were on their way to a highly sophisticated and refined stage of planning and administrative units of the industrialized economies. As efficient pools of resources[1] they could organize factors of production, and integrate otherwise isolated markets. They could turn financiers' money into productive capital, and thus institutionalized investors - sensitive to credibility, security and rates of return - welcomed the organizations which turned spontaneous opportunities into some opportune institutions.

In oil enterprise, where the degree of uncertainty was extremely high, and sinking capital before it could result in production was enormous, long-term and

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1. The concept has been developed in a comprehensive manner by Edith Penrose in The Theory of the Growth of the Firm, London, 1st ed., 1959. See also her The Large International Firm in Developing Countries, London, 1968.

rewarding concessions were pre-requisites for any investment. On the other hand the existence of numerous stages in between the production of the crude and marketing of the end-products, and the derived nature of the demand for products made the corporations enterprising in it to integrate vertically. Thus, integration apart from aiming at profits and exclusive controls - both of which have played a part in structuring the industry - was devised to coordinate operations of continuous stages of the one industry and imbue it with flexibility. This feature of the industry had perhaps the single most important impact on its trends of development and in the formation of its market structure; oligopoly. Furthermore it helped to ward off the rivals from the sources of low-cost crude by means of long term legal concession, and from products-markets by means of establishing great margins between transfer-prices and arms-length prices, and thus squeezing refining margins for them.

The pattern of natural distribution of resources of crude on the one hand, and the patterns of demand for its products on the other, made it an international industry. And this international organization of the industry plus the closed-oligopoly structure of its market, together with vertical integration of the firms operating in it and joint-ownership of the crude by the end-product-market competitors, equipped the industry with high degrees of manoeuvrability. Thus in a short time they could gradually out-manoeuvre the traditional low-cost fuel in the less developed host countries although these markets have, for the most part, remained marginal. In the advanced industrial countries, however, the industry was not unrivalled. In Europe, coal commanded high rates of employment. Furthermore, the oil had to prove sufficiently economical to warrant adjustment or early scrap of the existing machinery, and to win a race against the coal (which was mainly used to operate trains).

These common causes of supporting oil-operated industries, engineering demands for oil products, combatting established alternative sources of energy, did not however, rule out the occurrence of the precarious game of competition in the industry: In a price-competition of a 'perfect competitive' model the limit to the price-cut is set by the marginal price equalling marginal cost, and the maximum size of the production is fixed at this point which commands maximum revenue. This 'size of production' in turn determines the 'optimum size of a firm' in the 'theory of firm'.[1] But in a price-war - which is the most probable shape of price competition in an oligopoly - the price may descend further down the cost to paralyze the adversaries. Hence the tendency to substitute price-leadership,[2] for price wars. The tendency

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1. For an elaborate discussion and criticism see Penrose, Edith, The Theory of the Growth of the Firm, op.cit., pp. 9-13.

2. Markham, S.W., distinguishes Barometric firm leadership, dominant firm leadership and collusive leadership. See 'The Nature and Significance of Price Leadership', American Economic Review, 1951, p. 891.

however, has far less than dominated the scene, with resultant changes in the market structure and positions of the firms vis-a-vis one another.

I.3. Since 1921, arms-length crude prices were fixed on the basis of f.o.b. crude of the Gulf of Mexico, which required certain conventions: a) the price of f.o.b. Mexican crude determined world crude prices; b) Gulf of Mexico was the point of departure for transportation wheresoever, basing point; c) tanker rates were assumed to be 'given' and d) gravity was the sole arbiter of price differentiation. Thus the crude exported from the Persian Gulf port of Abadan to neighbouring India was priced as if it were transported from the Gulf of Mexico, and thus absorbed a 'phantom freight'. On the other hand, the Persian Gulf oil in Europe was to absorb the differential freight equal to Abadan-Europe minus Mexico-Europe.

Due to its volume, petroleum is freight-sensitive. Thus the oil-consuming nations felt concerned about the tanker rates. In the inter-war period some 50 per cent of the world tankers were owned, and the other 40 per cent were chartered for long-terms by the international oil corporations, and only 10 per cent were available for single-voyage charters. Wartime necessity helped establish two standard rates of freight, i.e. 'Tanker Market Nominal Freight Scale' (in Britain) and 'United States Maritime Commission' (in the United States). In reality, however, 'perfect rates' meaning 'coincidence of market rates with Scale' were rare and the normal cases were 'Scale plus x per cent' or 'Scale minus x per cent'.

This single-basing-point system prevailed until the Second World War, with the exception of Romanian oil in whose case, Romania-East America was assumed equidistant with East America-Carribean ports. This system of pricing favoured developing Asian and African low-cost oil, and the companies dealing in them had strong motives to expand over the markets beyond the watershed where the nominal cost plus freight prices broke even with American oil because the real cost in Africa and Middle East was much lower. Thus the enterprising attitudes of companies led to occasional cut-throat competition, e.g. Asiatic petroleum and Standard of New Jersey in Indian market in 1927. Besides, unsettling entries also happened, e.g. Soviet entry, into the hazardous market situations which were to be guarded by all means, not the least by market-sharing arrangements, long-term supply arrangements, supply-and-price control arrangements and so forth.

The outset of the Second World War temporarily stopped the flow of oil from the Persian Gulf to European market - a freight absorbing area. Then the delivery in Persian Gulf to European powers brought the phantom-freight under dispute and resulted in establishment of a dual-basing-point system of pricing, with Persian Gulf as a second point.

To assist recovery of the post-war European industries, self-sufficiency in oil products was desirable, and this required larger refining margins to spur construction of refineries which would mean either lower crude prices or higher products prices. Meanwhile, the relaxation of the U.S. price stabilization policy allowed the price of crude f.o.b. Gulf of Mexico to rise from $1.05 per barrel to $2.60 per barrel, a margin high enough to provide opportunities for manoeuvring to retain West European market. Thus crude f.o.b. Persian Gulf plus Suez Canal tolls plus USMC freight rates from Persian Gulf to London was equated against crude f.o.b. Mexican ports plus USMC freight rate from there to London. In other words London was rendered a point where prices of Persian and Mexican Oils were set to be equal. However since London was nearer to Mexican Gulf than to Persian Gulf, Persian oil was thereby reduced by some 44¢ per barrel (equal to freight from equalization point in southern Italy to London according to scale rates).

In 1948 Raas-at-tanoorah replaced Abadan, and Carribean that of Mexican Gulf as ports of export, by virtue of which Middle Eastern oil price was reduced from $2.22 to $2.03 per barrel. Since December 1948 - implementation of the U.S. conservation policy ÷ Middle Eastern oil increasingly compensated for American shut-down capacity. In fact Europe paid more for its imported oil than did the U.S. On this ground European Co-operation Administration (ECA) raised an objection. As a result of this objection European price was reduced by 15 cents per barrel - a reduction which was already initiated by the Gulf Oil Company.

Later, New York replaced London as the point of price equalization and the dominant freight rate which was USMC minus $35\frac{1}{4}\%$, was made the basis of price determination. This arrangement reduced the price to Europe by another 13 cents per barrel.

The system, notwithstanding its pragmatic convenience, was fraught with inconsistencies and anomalies, under which it eventually broke down. Two examples would suffice: a) In 1952 the Mutual Security Agency (a substitute for ECA) brought a case in the US Justice Administration against Jersey Standard, Socony Vacuum and Caltex. The substance of the case was that since on the one hand, the Venezuelan oil of 36^{O}API was \$2.65 bbl and spot-freight from Venezuela to New York was \$0.38 bbl, (total \$3.03), and on the other hand the freight from Persian Gulf to New York was \$1.70 bbl, then crude f.o.b. Persian Gulf should have been 3.03 minus 1.70 equal to \$1.33 bbl, while the three companies received their oil from an affiliate of Aramco at \$1.43 bbl. b) Another anomaly which was named after its author's name - Stocking anomaly - was that the demand for tankers was derived from the demand for oil. Thus a boost of demand for oil increased the demand for tankers and consequently increased the freight rates, and this, paradoxically, depressed the price of oil; while a depression of oil demand, depressing the freight rates, would increase the price of oil. Thus because of these and other reasons, by the early fifties the system gradually corroded and was replaced by posted price system.[1]

I.4. The first oil exploration activities in Iran were undertaken by a British geologiest 'Loftus' in 1885. The first concession, however, was granted to a British 'Mr. Tory' five years after Drake's discovery, to cover oil as parte in toto. In 1872 Baron Julius de Reuter was granted a concession to the amazement of the world[2] which consisted of:

The monopoly of railway (Art. II), tramway (Art. III, IV, V and VI), extracting all mines excepting gold and silver and precious stones (Art. XI-XII), all government forests (Art. XIV) and uncultivated land (Art. IV), constructing canals and irrigation works (Art. XV), an option of a National Bank (Art. XX), and all enterprises

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1. The literature is ample, see for example Leeman, Wayne, The Price of Middle East Oil, New York 1962; Nielson, R., Oil Tanker Economics, Bremen, 1959; Mansoor, Foroozan, Iqtisadi Naft, Tehran, 1342 ; DeChazeau, M.G., and Kahn, A.E., Integration and Competition in the Petroleum Industry; and Cassady, R., Price Making and Price Behaviour in the Petroleum Industry, 1956.

2. The political history of the concession has been abundantly discussed in the related literature, so repetition will be rather unnecessary. The following make some very interesting reading: Lord G.N. Curzon, Persia and Persian Question, London, 1892, pp. 480-481. The author called the concession 'a political bombshell all over the world'. Benjamin Shwadran in his The Middle East, Oil and the Great Powers, N.Y. 1955, p. 14, speaks of it as 'a concession that in the era of sweeping concessions put all the rest to shame'. Sir Percy Sykes in his A History of Persia, 1921, pp. 370-72, gives a colourful account of its historical setting. Sir Henry Rawlinson in his England and Russia in the East: A series of papers on the political and geographical conditions of Central Asia, London, 1875, p. 126, examines why the concession was not practicable. And Lenczowksi in his Russia and the West in Iran, N.Y., 1949, p. 4, examines its consequences in Persia.

connected with roads, telegraph systems, factories and operating the entire customs of the country for twenty-five years (Art. XIX),

Upon payment of: A stipulated sum for the first five years, and 60 per cent of the difference between the annual net proceeds and the amount realized 'then' by the government for the remaining 20 years (Art. XIX) plus 20% of the profits accruing from railways (Art. IX) and 15% of those derived from all other sources (Art. XI-XII).[1] This concession was annulled shortly afterward.

In 1884 the first 'oil concession' was granted to the firm of Hotz and Co. of Bushehr. By this time American oil was expanding over European markets and Europe was searching for oil in the East. Caucasian oil had already been developed by Nobel Brothers.[2] Hotz concession, however, was aborted in 1899. But in the same year two Russian subjects obtained a mining rights concession in Azarbaijan (Gharajeh-Dagh) which resulted in eight mining enterprises before it was invalidated under the Soviet comprehensive annulment of all Russian rights obtained in the Tsarist era.[3]

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1. All references are to the text of the Concession of the Persian Government to Baron Reuter, July 1872.

2. Alfred Nobel, the founder of the Nobel Prize was among them. See Tugendhat, Oil, The Biggest Business, 1968, p. 34.

3. 1921, Trans-Soviet Treaty, League of Nations, Treaty Series, 1922, Vol. IX, pp. 383-415.

By 1901 'Burmah Oil' was drilling in Burmah upon payment of five per cent of the gross value of oil without any fiscal exemption on its operations. In Baku, however, the royalty was twenty-five per cent of the value or the volume of production, and the maximum size of the area covered by the concession was one square mile offered by auction. The discovery of oil was by no means guaranteed.[1]

D'Arcy concession on May 26, 1901, against such a background, gave way to suspicions of diplomatic meddlings,[2] and attracted public opinion.[3] The concessionaire was conferred upon: an exclusive right to explore, extract, refine or treat in any other way and suitable for commerce, all hydrocarbon resources in an area of 500,000 square miles for a period of 60 years (Art. I), the exclusive right to lay pipelines to the Persian Gulf which barred the entry of potential rivals. Upon payment to

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1. Caucasia belonged to an almost developed part of the industrial world. Thus it did not suffer from the hazards, uncertainties and infra-structural bottlenecks comparable to those in a country like Persia. Out of context comparisons, therefore, do not seem to do full justice to the facts of the case. For such comparison however, see, for example, Mikdashi, Z., A Financial Analysis of Middle Eastern Oil Concessions, London, 1966, p. 20.

2. For a detailed story in his own words, see Sir Arthur Hardinge, A Diplomat in the East, London, 1928, pp. 278-280. Also Fatemi, Oil Diplomacy, A Powder Keg, N.Y., 1954, p. 357, where he writes of military support for D'Arcy. See also Elwell Sutton, Persian Oil: A Study in Power Politics, London, 1955, p. 15, where he speaks of 'sweeteners' given to the Shah. Also Fateh, M.K., Panjah Sal Naft-e Iran, Tehran, 1335, p. 254, where he documents 'gifts' to the Shah's mininisters. And also see Elizabeth Monroe, Britain's Moment in the Middle East, 1914-1956, London, 1965, pp. 105-6 where she argues that British government was entirely impartial in Shah-D'Arcy concession.

3. A story of an espionage based on a conflict between

/Continued over

the government of a 16 per cent after-tax income of the company (Art. X): a fixed rate detrimental to the concessionaire when profits were below the expected 'reasonable' returns and to the host government when the profits were excessive. Besides, the features of the concession proved to be ruinous to the healthy conduct of activities in the long-run, in that the concessionaire was the sole arbiter of development and that the concession did not provide for change of terms in the future.

The concessionaire formed The First Exploration Company in 1903, to be assimilated in the Concession Syndicate of D'Arcy-Stratcona and Burmah Oil in 1905.[1] By 1908 all investment was sunk,[2] until the first rig tapping a large reservoir on May 26, 1908 in Masjid-e Suleiman.[3]

In 1909, the Syndicate concluded some other agreements of expediency, which in a later date became

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Footnote 3 continued from page 14.

Rockefeller and Deterding is first told in La Grapouillot in Paris, then retold in Anton Zischka, La Guerre Secret du Petrole, later published in the Persian newspaper Shafagh-e Sorkh, and rooted in public opinion.

1. For a discussion of a case for the British government's preserving the concession see Churchill, Winston, The World Crisis 1911-1918, London, 1938, Vol. I, especially p. 54.

2. An emotive account of the story is to be found in Henry Longhurst, Adventure in Oil, London, 1959, p. 72.

3. In his hyperbolic language, Stephen Longrigg called this 'one of the most significant events of all Persian history', see Oil in the Middle East, op.cit., p. 19.

bones of contention:

a) Bakhtiari Oil Company Agreement - in effect the Company was formed with an initial capital of 400,000 pounds sterling, 3 per cent of which went to local chieftains as share-capital.

b) Bakhtiari land agreement.[1]

c) Bakhtiari-Syndicate security provision agreement.[2]

d) Khazal-Syndicate agreement for provision of one square mile of land for construction of a refinery and guarantee of security in Khuzistan.[3]

The formation of Anglo-Persian Oil Company (APOC) in 1909 took place against the background of a prior establishment of the Jersey Standard and Royal Dutch Shell concomitantly. The irrevocable trends in the naval developments constituted a pressing necessity for the British government to become the owner/producer of its supplies of liquid fuel.[4] The government, therefore, bought

1. For an analysis of the financial terms of some transactions under this agreement, see Mikdashi, An Analysis..., op.cit., p. 19.

2. Ramsay Macdonald criticized these agreements, in the House of Commons, as the infringement of Persian Government's sovereignty, and an attempt to weaken its central authority. See Fateh, op.cit.

3. On May 6, 1909, on behalf of H.M. Government, Sir Percy Cox gave Sheikh Khazal a guarantee that Britain would not allow the Persian Government to disturb the status quo of himself or his heirs and successors. See Sutton,E., op.cit., pp. 20-21.

4. Policy Statement, June 17, 1914, HCD, Col. 1140.

its way in towards a controlling share.[1] This was followed by an APOC-Admiralty sales contract, the confidentiality of the terms of which became another source of contention in a later period.[2]

In the meantime the APOC was acquiring shares in Turkish Petroleum Company (TPC), later Iraq Petroleum Company (IPC), and Kuwait Oil. American sources were becoming growingly concerned about worries of exhausting reserves, and British government established in Southern Persia a Southern Police Regiment (SPR) - a body of 55,000 - under General Sykes.

The collapse, in 1917, of the Tzarist Russia, caused the unilateral denunciation by the Soviet government of 1907 Russo-British confidential pact dividing Persia into zones of influence, and thus gave the British a full sway. Henceforth, events unfolded rapidly: Vosugh-Firuz Cabinet was introduced with Armitage-Smith - assistant secretary to British Treasury - as financial adviser, and the process culminated in 1919 Agreement.

In 1920 APOC was engaged in negotiations concerned with the purchase of a concession granted to a Khoshtaria in 1916 covering 'North Persian' Oil, and on November 29th, 1920, it was negotiating yet another

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1. In 1914, the share of the government was £2,001,000 as against Brumah's £1,069,000 and public £1,530,000.

2. Parliamentary Debates (Mozakerate Majlis), Tehran, XLV (1951), p. 8.

concession to cover Azerbaijan and Khorasan.[1] But a potential snag was that neither the APOC nor the Khoshtaria concession had received the parliamentary ratification, required by Article 24 of the 1906 constitution of Persia. Hence the necessity, from APOC point of view, of introducing any change, interpretation or supplement which by its approval in the parliament would implicitly enact the original concession. One such 'interpretative' attempt was that of Armitage-Smith, containing variations to the detriment of Persia,[2] in that, a) the profits of the British Tanker Company, a fully owned subsidiary were to be excluded from royalty payments; b) the profits of other subsidiaries were also excluded to the extent that they were trading in non-Persian oil; c) the profits of subsidiaries refining or marketing Persian oil outside Persia were made eligible for sizeable deductions before computing royalty payments; d) subsidiaries were so defined as to include only those in which APOC had a majority share.

By 1921, many impediments were obstructing the implementation of the 'Vosugh' agreement, when a coup eliminated any chance the 'interpretative' agreement had for ratification. Two years later, Sinclair was defeated

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1. Fatemi, op.cit., p. 79.

2. In fact the deterioration was due to erosion of the bargaining position of Persia vis-a-vis growing power of the British government. See for example Hossein Makki, Tarikh-e Bist Saleh-e Iran, Tehran, 2 vols.

in Persia,[1] however, in 1924, Kavir-e Khurian concession was revitalized, and a majority share of it was sold to the Soviet government via Khoshtaria.

On November 28, 1932, D'Arcy concession was unilaterally cancelled.[2] Objections and resentments ensued. Bargaining got underway and on April 29, 1933 a new concession was concluded, ratified and endorsed, and became a law. The concession embodied the following changes: a) the area was restricted (Art. 2.A), and was to be further restricted to 100,000 square miles (Art. 2.B); b) profit-sharing arrangement gave way to a tonnage-royalty system at 4S per ton (Art. 10.I.a), with allowance for possible devaluation of sterling in terms of gold (10-V, a,b), and with a guaranteed minimum of £75,000 per annum (10.I.c); c) Kermanshah Oil was to be operated under a subsidiary (Art. 9), and d) the right to lay pipe-lines was rendered non-exclusive (Art. 3).[3]

The 4S/ton arrangement, which in a year of depression - such as was the case when the new concession

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1. APOC fought this war: Rumours of Sinclaire-Jersey arrangement stalemated the government, because Jersey had an arrangement with APOC, which was contrary to a Persian decision not to give a foothold to APOC in the North. Besides the story of the 'Teapot-Dome' - Sagga Khuneh- Scandal which resulted in the death of American consul in Tehran is suspected to have been engineered by Prince Firuz, which if proven right, confirms British involvement.

2. For an analysis of the politics of cancellation see Noori, Hossein Sheikh Hosseini, A Study of the Nationalization of the Oil Industry in Iran, Colorado State College, Ed.D., 1965, pp. 70-75.

3. References are to the Articles of the text of Persian Concession 1933-1993.

was signed - seemed more favourable to Persia than previously, dated back to 1925 TPC concession, which by then was assumed equal to 1/8 of the value of the Middle East crude f.o.b. Persian Gulf. One important feature of this arrangement was that the oil industry managed to relieve itself of the intrusion of governments, guard against information-leak, and protect managerial autonomy.

In 1934, Kermanshah subsidiary started to operate. A year later, APOC became Anglo-Iranian Oil Company (AIOC).[1] Two years later an abortive concession - Amiranian - was granted to the Seaboard Oil Co. and in 1939 the Dutch 'Algemeene Exploratie Mautschappij' set a precedent of a 50-50 arrangement, to be later abolished due to wartime operations.

As a result of the start of the World War II, Iran found itself under the occupation of the Allies. The oil industry thus was geared to the needs of the military command. It was high time the Soviets used their Kavir-Khurian concession as a vehicle of proposals destined to repel Jersey, Sinclaire or AIOC from their border areas.[2] Agitations by the British to have Soviet

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1. The change of the name from Persia - the land of the Parsis - to Iran - the land of Aryans - had a significant political implication at the time. Therefore, they should not be confused as some authors happen to have done, for example Noori, op.cit., throughout his thesis.

2. Although Jersey and Sinclaire did not publicize their terms, however, Michael Brooks argues on evidence that Kaftaradzeh package was so embarrassingly superior to Iran as compared to that of other bidders that they decided to leave the scene for a while. See Brooks, Michael, Oil and Foreign Policy, London, 1949.

proposals turned down helped to boost a latent anti-concession feeling in the public, as a result of which the parliament ratified a proposal by a Tudeh party member denying concessions to any foreign bidder before it was thoroughly examined by the parliament. But Kaftaradzeh proposals were turned down before the enactment of the parliament, and this gave government the embarrassment of partiality, to offset which a motion by Jebheye Melli - Massadegh's National Front - was carried to the effect that:

a) the government was not allowed to enter into any negotiations of legal consequence with any government, company or representatives thereof;

b) the government was only allowed to discuss sales and inform the parliament of the proceedings;

c) violations of the above by any government official would make him liable to solitary imprisonment of 3 to 8 years and deprivation from holding any civil service post for life.[1]

Nationalistic agitation was a dangerous theme for the British to acquiesce in, but so far as it could be exploited against the Soviets, they were not unhappy about it.

During the period February 19 to March 11, 1946, when the question of moving Soviet troops from Northern Iran was negotiated between the Iranian delegation headed by Qavam - Iranian Premier - and Stalin-Molotov, the question of a joint-stock Irano-Soviet Oil Company was also involved. On April 4, a communique was signed

1. Known as the Law of 11th Azar 1323.

between the two governments, which while displaying too many concessions by the Soviets as compared to their earlier proposal, confirmed the agreement to establish a joint-stock Irano-Soviet Oil Company, to be ratified by the parliament within seven months after March 24.[1]

Early in 1947,[2] the premier reported to the parliament on his negotiations and a joint-stock company, parliament invoking the law of Azar 11, 1323, denounced the government negotiations, instructed the government to study the 'oil wealth' of the country so that the parliament could prepare 'through enactment of necessary laws' for its commercial exploration. Meanwhile no concession, and no share in / any company would be granted to any foreigner whosoever (para. B and C). In all cases where the rights of the Iranian nation, in respect of the country's natural resources, whether underground or otherwise, had been impaired, particularly with regard to the southern oil, the government was required to enter into such negotiations and take such measures as were

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1. Qavam, a brother of Vosugh, is a politician often praised for his shrewdness. Muzaffar Firuz, a grandson of Nosrat-od-dowleh Firuz, ex-foreign minister, and the then Iranian Ambassador to Moscow, is suspected to have played a double role (See Ghasemi, Oligarchy in Iran, Tehran, 1351). The Americans later revealed to have sent an ultimatum to the Soviets that in case of their delay in evacuating their troops from Iran, they would also return. These all explain some aspects of the change in Soviet attitude. However, the similarity in the combination of the post-World War I cabinet to that of the post-World War II, is suggestive of certain inertia in the British rules of diplomacy.

2. Election was deliberately delayed through political monoeuvres until Soviet troops were pulled back.

necessary to regain the 'natural' rights and inform the parliament of the results (para. D).

By then the mechanism was set into full operation: parties and individuals were see-sawing in opposing the 'foreign' company, social xenofuge was accelerating, and sensationalism was leap-frogging. Meanwhile the British foreign office was 'playing around with the prime ministers and cabinets',[1] and AIOP having established its marketing network in Europe, Africa, Middle East, India and Australia, and refineries in Abadan, Britain, France and having produced marginal production fields in the UK and Argentine, was busy making long-term contracts with the crude-short Standard and Socony Vacuum (September 1947).

Business and political missionaries followed but out of the six teams only that of Mr. Gas resulted in an agreement, and that an abortive one.[2] The changes embodied in it were: a) the royalty being raised from 4 to 6 shillings per ton (Art. IIIa); b) Iranian Government being exempted from British tax levied on the company (Art. IV.a); c) a minimum of 400,000 pounds being guaranteed as regards the 20 per cent of the net profits (Art. IV.a); and finally d) the tonnage tax being raised from 9d/ton to 12d/ton (Art. VII).[3]

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1. Sutton, op. cit., p. 199.

2. For a lucid account and comparison of the terms of the proposals of these missionaries see Fuad Rohani, Tarikh-e Melli Shodan Sanat-e Naft-e Iran, Tehran, 1354. Also Ghosh, S.K., Anglo-Iranian Oil Dispute, India, 1960.

3. The references are to the text of Golshayan-Gas Supplemental Agreement.

In parliament, it was severely criticized and refused on the grounds that with that increase in Iranian royalty, the government's income would have barely equalled 35 per cent of the Company's net profits, to be compared to Venezuelan take of 50 per cent and Iranian tax would not have exceeded 2.2 per cent of net profits to be compared to the British tax of 45 per cent.

The events culminated in the Law of Nationalization of March 14, 1951:[1]

> In the name of the happiness and prosperity of Iranian Nation, and in the interest of the world peace, it is hereby resolved that the oil industry shall be nationalized throughout the country with no exception; that is to say, all the operations, extraction and exploration shall be conducted by the government. [2]

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1. The concept of nationalization is comprehensively defined in Gillian White, Nationalization of Foreign Property, London, 1961, pp. 42-43. A contradistinctive legal discussion of the concepts of nationalization, etatization, socialization, dispossession, expropriation, confiscation and requisition is advanced in Fuad Rouhani, op. cit., pp. 17-43. A discussion of the Indemnity clause of Iranian Nationalization Law is to be found in Some Documents on the Nationalization of Oil Industry in Iran, Washington D.C., Iranian Embassy, 1951. For a study of the concept of ownership as a historical dynamic category see Ghosh, op. cit., pp. 206-7.

2. The literature on nationalization of Iranian oil forms a wide spectrum of assessments varying from objective and technical criticisms to subjective and emotive appraisals. P.H. Frankel's comment in his Oil, Facts of Life, pp. 10-11 and G. Stocking's in his Middle East Oil, p. 142, are based on sound, technical assessments of the realities of the world oil industry. Some are politically biased and -; at times - superficial, i.e., Stephen Longrigg, Oil in the Middle East, London, 1968, pp. 50, 153, 163; and a little less so, Norman Kemp, Abadan, 1953, pp. 25-8, 90, 93-94, 56, etc., expressing a company point of view and Elwell Sutton, op. cit., a Persian point of view. Few attempt at a socio-economic analysis and still fewer succeed: see for example Edward Sabler, "Iran, the Crisis in Microcosm" Monthly Review, July 1951, p. 68.

Britain resorted to economic pressures,[1] legal suits,[2] and military threat[3] while attempts to overthrow the government were never altogether ignored.[4] However, time also worked against the government, eroding its domestic and international position, and finally on August 23, 1953, a most turbulent episode of Iran's contemporary history was brought to an end with sobering effects for potential nationalizers.

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1. Oil revenues were stopped, refinery was shut down and sterling funds held to Persian credit by British Banks were frozen.

2. Official Records of Security Council, Sixth Year, No. 560, pp. 13.22.

3. Kemp, Norman, Abadan, op.cit., pp. 156-7, 188 and Chapter 9.

4. Qavam was again restored to power, but it was a farce. For his side of the story see: Arsanjani, H., Sie Tir, Tehran, 1334, 80 pages.

CHAPTER II

FACTORS INFLUENCING INVESTMENT BEHAVIOUR OF IRANIAN OIL CONSORTIUM

> When vertically integrated firms which are competitors in markets for end products jointly control the production of their raw material, the rate of expansion of the output of the raw material will be influenced by the competitive strategies of the competing firms, and may well be reduced below the rate that would be attained if the requirements of every one of the firms sharing the ownership of production were met.
>
> Edith Penrose[1]

The aim of this chapter is two-fold: first to look closely at some factors which influence the investment behaviour of the Consortium as a corporation, i.e., the organizational structure, the general policy directives, and the terms of access to resources as embodied in the Agreement; second, to look at the requirements of the inter-company arrangements which influence the behaviour of individual member-firms differently corresponding to their individual position in regard to their internal resources, world market conditions, and long-term growth strategies.

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1. The Growth of the Firms, Middle East and Other Essays, 1971, p. 200. 'To be otherwise, two conditions must be satisfied: 1) the parents as a group must be willing to invest in expanding capacity to the full extent necessary to supply all of the demands on the affiliate by all owners; 2) the price that the parents which want extra supplies must pay must not reduce the demands of these parents on the affiliate.' Ibid., pp. 208-9.

II.1. Organizational structure. The nationalization process of 1951-53 ended up in a settlement, on the 15th of August 1954, later to be enacted on the 29th of October 1954, which provided for the following share-holdings of the oil lifted in Iran:

British Petroleum	40%
Royal Dutch-Shell	14%
Compagne Francaise des Petrole	6%
Exxon	8%
Mobil	8%
Texaco	8%
Gulf	8%
Standard of California	8%

In 1955, following suggestion by the US State Department that American interests be diversified, pursuant to Article 18 of the Principle Agreement, each American major participating in the Consortium transferred one eighth of its holdings to Iricon Group of 'Independents', which thus acquired a five per cent share in the Consortium.

Iricon Group consisted of the following interests:

Richfield	3/12 of the 5%	=	1.250%
Signal	1/12 of the 5%	=	0.417%
Hancock	1/12 of the 5%	=	0.417%
Sohio	1/12 of the 5%	=	0.417%
Getty	1/12 of the 5%	=	0.417%
Tidewater	1/12 of the 5%	=	0.417%
Atlantic	1/12 of the 5%	=	0.417%
San-Jacinto	1/12 of the 5%	=	0.417%
Aminol	2/12 of the 5%	=	0.833%

The 'Independents' in the Iricon group were required to designate a common agent to act for them in all matters, however each company was to act for itself in receiving and marketing its share of crude oil and petroleum products, in 'posting' its price and in paying its royalty and Iranian income tax. As agent, Iricon vested with all voting rights in the shares in the holding company.

The selection of the above members to form the Iricon Group involved ramifications of legal and business-strategic considerations: Since the joint ownership provided a potential for collusive marketing arrangements (in the face of anti-trust laws), the State Department was advised to resist direct involvement in handling applications to avoid any possible legal liability.[1] As to business-strategic aspects the main consideration was the fact that the selected companies were engaged in the production and marketing of the Near East oil throughout the world, hence their ability to absorb the Iranian production without unsettling world markets.

The entry of independents in Iran was a landmark, not only because it was a very prosperous enterprise,[2]

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1. See 'Multinational Corporations and United States Foreign Policy: Hearings Before the Sub-committee on Multinational Corporations of the Committee on Foreign Relations - United States Senate - Ninety-third Congress, Second Session on Multinational Petroleum Companies and Foreign Policy', Part 7, pp. 557-558. Henceforth to be referred to as 'Hearings'.

2. Frankel, P.H. called this entry 'a licence to print money': Matai, Oil and Power Politics, London, 1966, pp. 95-96.

or encouraged actual competitors for the established majors, but also because of their important impact on the future trend of developments.

Altogether, the Consortium members incorporated for operational purposes two Operating Companies and jointly guaranteed the performance by them of their respective obligations (Art. 3).[1] They were:

a) Iranian Oil Exploration and Producing Company (IOEPC)

b) Iranian Oil Refining Company (IORC).

The constitution and internal management of the Operating Companies were regulated by the statute, the relevant parts of which were approved by both parties to the Agreement (Art. 3.C). Two of the seven directors on the board of each company were to be Iranian (3.D).

The Exploration Company was vested with the rights and powers to explore for, to drill for, to produce, to extract and take crude oil and natural gas, to operate field topping-plants and sulphur-plants and otherwise process oil and gas produced by it to the extent necessary for its operations, to store such oil and gas and derivatives and products therefrom and to transport and deliver the same by any means, including boarding on board ships (4.A).

The Refining Company had the rights and powers

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1. All such references are to the Articles of The Principal Agreement.

to refine and to process crude oil and natural gas produced by the Exploration Company, to refine and manufacture, derivatives and products therefrom alone or with other substances, and to store, pack, transport and deliver by any means, including boarding on board ships, such crude oil, natural gas, derivatives and products (Art. 4.A).

Both Companies had the full right and power to decide and carry out ramifications of exploratory, constructional, communicative, transportational and manufacturing operations (4.B). These rights and powers, exclusive in the area (Art. 5.A), were not to be revoked or modified (4.D) except by arbitration (41.C).

Vis-a-vis these rights the Operating Companies were under the obligation to conform with good oil industry practice and sound engineering principles applicable and appropriate to operations under similar conditions in conserving the deposits of hydrocarbon, in operating the oil fields and refining and in conducting development operations (4.F.1), to carry on exploration operations adequate to provide reserves enough to support the rate of production (4.F.2), to maintain full records of all technical operations and to keep accounts in such a manner as to present a fair, clear and accurate record of all the activities of the Operating Companies (4.F.3), to substitute the foreign staff by the locals having requisite qualifications as far as possible (4.F.4), to prompt the training of such local staff in consultation with NIOC (4.F.5) and to be always mindful of the interests of Iran (4.F.6).

To make sure, a supervision proviso was made granting NIOC the right of access to plans, maps, reports, records, scientific and technical data on condition that their secrecy was observed (4.H.1.2) and that the normal activities of the companies were not hampered by auditing (4.G.1).

Vis-a-vis the Operating Companies, each Consortium member was represented by a trading subsidiary, having the rights and obligations with regard to purhcase and resale (18.B.A). They were to share the nationality of their respective parent companies unless some tax or foreign exchange consideration made a different nationality desirable (18.C).

Furthermore, two other organizations were also caused to be incorporated:

a) Iranian Oil Participants Ltd (IOP)

b) Iranian Oil Services Private Company (IROS).

The main function of IOP was to manage the holdings of the Operating Companies and none of its expenditures were to be charged to the operating costs. While IROS was to provide the services and materials required by the Operating Companies and all its expenditures were to be counted with the Operating Companies at cost, plus administrative overheads, which in turn would be charged to their operating costs or capital expenditure, whichever was appropriate [1] (See Chart 1, page 32).

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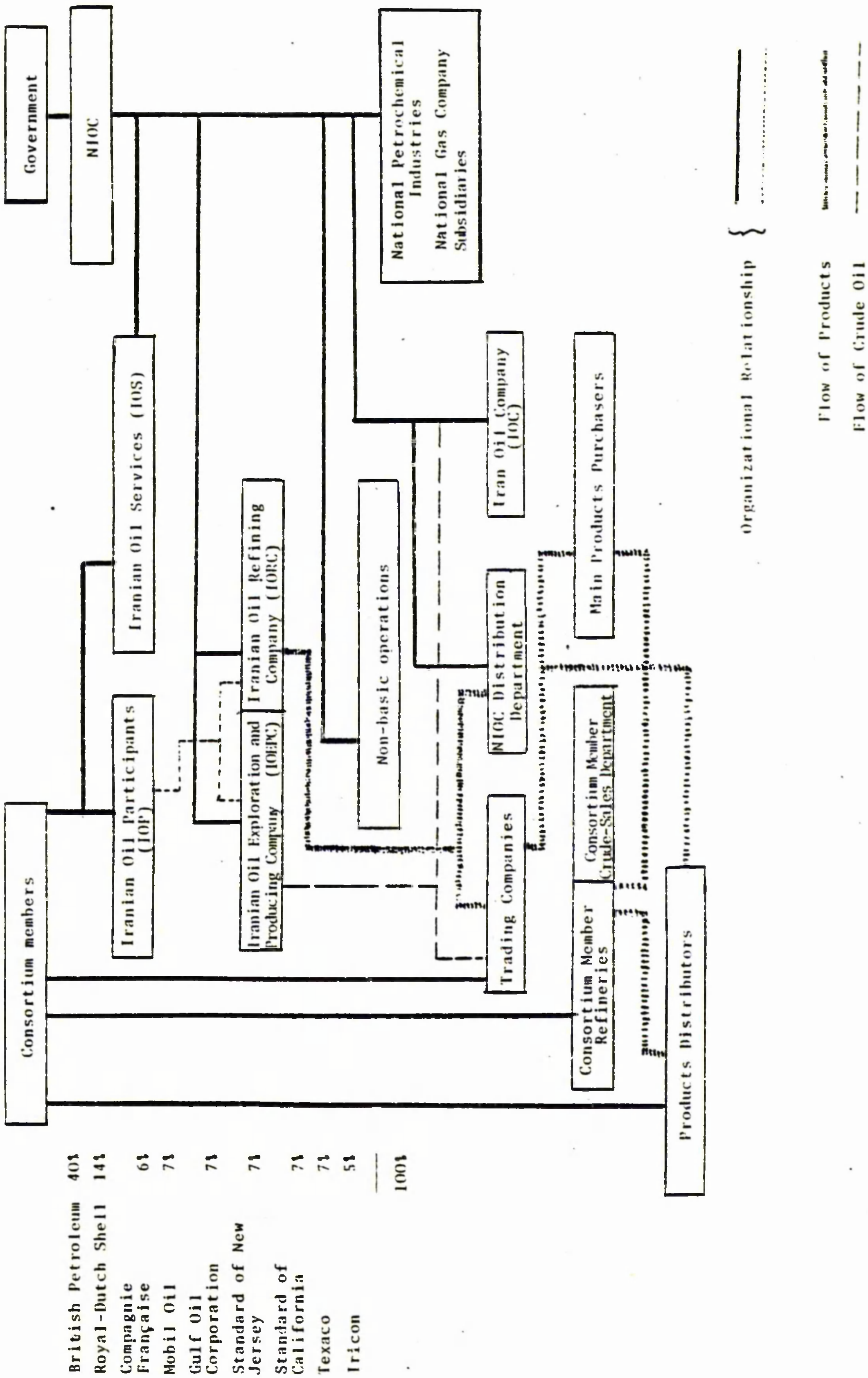
1. Letter from Mr Page to Minister of Finance, 18th August, 1954, Tehran, White Book of Iranian Oil, 1966.

ORGANIZATIONAL CHART OF THE PARTIES TO THE AGREEMENT OF 1954.



Source: Ghasemzadeh, Iqtisade Nafte Iran, Tehran, 1317.

II.2. Policy directives. The distribution of world oil reserves, and the pattern of demand for oil and its products require the operation of corporations across the national boundaries. Trans-national operations, thus, call forth multinational firms whose lines of business occasionally intersect with those of international relations of the countries involved. Therefore, a possible coordination of these two helps smooth operation of the industry and a more efficient functioning of the industrial system.

One such case in point was the need for a secure flow of oil to Europe in the aftermath of the Second World War. The war had badly damaged the industries of Europe and the urgent need for recovery made them very sensitive to any ruptures in the flow of oil supplies to their 'normal' markets, or seizures of those resources either from within or without.

Thus the international structure of the oil industry on the one hand, and the requirements of the industrialized world on the other, called for development of broad lines of coordination between the functions of the oil enterprises and governments of the industrialized countries, whereby:

a) The oil companies were generally encouraged to resist conceding to Middle East governments' demands up to the point that external pressures put the security of the concession in jeopardy. The State Department played a vital role in analysing those pressures.

b) The oil companies were urged to meet the demands for extra revenues of Middle Eastern governments through increasing production and thus help provide low-cost oil for European recovery.

c) The oil companies were encouraged to relinquish the areas not expected to yield commercial production, and also provide space for independent competitors.

d) The companies were guided to provide industrial democracy and attend to grievances of the local personnel and labour.

And the State Department undertook to consistently:

a) Continue to discourage foreign governments from making unreasonable demands on oil companies.

b) Point out the advantages gained by oil producing states from operations of foreign companies.

c) Continue to emphasize the necessity to respect valid concession contracts.

d) Endeavour to discourage any moves by Middle Eastern oil producing governments to form cartels, to increase royalties or to control production.

e) Continue urging oil producing states to put royalties to capital formation.

f) Continue endeavouring to modify legislation unattractive to foreign enterprise and other restrictions to the expansion of the oil industry abroad.

g) Discourage in every appropriate way, tendencies of Middle East states to engage in oil activities, move towards nationalization or expropriation of oil properties.

h) Assist operations of government oil organizations where such organizations already exist, while continuing to point out the disadvantages of government oil operations in general.[1]

II.3.1. Provisions of the Agreement as regards cost of access to resources. The Operating Companies had, within the period and area, the unrestricted right to use and move all the fixed assets (6.A) and erect or install any new, additional or substitute one (6.B). All the pre-effective date stocks of stores and materials, plant and equipments, transports and installations within the area were possessed by the Companies (6.C.1) free of any charge whatsoever (6.D).

The Operating Companies were to include in each year a fixed assets charge of £2,600,000 in the case of Exploration, and £4,100,000 in the case of Refining, in the respective company's operating costs and to dispose of the proceeds at their discretion (6.D.1).

As the stores and materials were used, the Operating Company using them was to include the book-value

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1. 'State Department Policy Paper', September 10, 1950, in Hearings, op.cit., part 7, pp. 122-39.
I have cautiously selected these points from an exposition of American post-war foreign policy in a hearing organized by the US Democrats. The merits of these attributes to the foreign policy of a rival party in government, however, can somehow be doubted, as was pointedly mentioned by Professor Penrose, on the ground of party political considerations.

thereof (as at the time originally put in store), either in its operating or other costs, or in capital expenditure, depending on the use made. The original cost of each item of movable plant and equipment, mechanical transport and drilling plant and tools (reduced by depreciation for periods prior to the effective date at a rate based on its estimated useful life) was to be depreciated at a rate based on the portion of its estimated useful life remaining after the effective date, and the Operating Company using such items was to include such depreciation either in its operating or other costs, or in capital expenditure as appropriate (6.D.2.a).

If however any of such stocks of stores or materials, movable plant and equipment or mechanical transport were used in the 'non-basic' operations - ancillary operations by NIOC (Art. 17), the related Operating Company would deduct the said book-value of any item so used, or the appropriate part of depreciation of movable plant and equipment and mechanical transport, from any payment due from such Operating Company to NIOC in respect of expenditure for non-basic operations.

As regards the current investment, the Operating Companies were to finance the cost of assets, and debit NIOC for the same. Each debit so incurred was repayable in equal annual instalments over the ten year period following the commencement of use of the assets with respect to which such debit was incurred or over such lesser period as NIOC may have agreed. The Operating Company which erected or installed such asset was to credit NIOC for each year during such ten-year or lesser period with a 'fixed assets charge' in respect of such assets in each year of such period, equal to the due proportion of the cost of such assets, thereby settling the debt at the end of the period in question (6.E.1). The charges thus paid were included in the operating costs (6.E.2).

As regards land, the Principle Agreement provided for an area of beyond 500,000 square miles onshore and offshore (Art. 49, Schedule 1), for a period of 25 years extendable for three five-year periods (49.A-E). Besides, the Companies were entitled to the right of exclusive use without charge of:

a) All lands which NIOC or Iranian Oil Company (IOC) had the right to use for their operations other than internal distribution, except the right of way for the pipeline from the Naft-e-Shah field to the Kermanshah refinery and the lands on which the pumping stations and the terminals in connection with such pipelines were located (7.A); and

b) Any land belonging to Iran, reasonably required for use in connection with operations. Any such land not then in use by Iran was to be given gratuitously, but in the case of land then in use by Iran or others, a rent decided on the then use of the land was to be made to NIOC (7.B.1).

In cases where lands were purchased or leased in consideration of a lump sum payment, the amount thus paid to NIOC constituted a debt due from NIOC to be settled through payments of land assets' charge in the remaining period of the Agreement (7.B.2), and to be included in the operating costs (7.B.4).

Thus there was no constraint regarding land. The vast areas of proven reserves were under the exclusive control of the Companies and they were free from any law-of-capture type of inducement for wild-catting, which would have incurred higher costs of too fast a production, and lower revenues due to consequent market depression. Under these conditions the Companies could have planned for optimum number of wells and approximate the maximum efficiency rate (MER) of depletion for reservoirs. Specially in the view of the fact that the time-horizon of twenty-five to forty years stretches beyond any practical investment consideration.

As regards the ancillary materials such as soil, sand, limestone and other building materials, and water, the Operating Companies had access without charge, subject only to any then existing rights of third persons (8.A.& B).

As to the crude oil and products consumed in operations, both Companies were entitled to the free of charge use of any amount required (10.A,B), on payment by the Exploration Company to the Refining Company for the products thus used, the weighted average of the posted prices of the crude oil delivered to refinery and used in their manufacture, plus the refining company's cost of refining in respect to such products, and by the Refining Company to the Exploration Company for any substance other than crude oil or natural gas, a price to have been agreed between them and approved by NIOC (10.C). Payments thus made by either Company were to be included in its operating costs by the payer and credited to operating costs by the payee (10.D) free of any obligation to NIOC or Iran (10.E).

As to consuming gas in operations, the Exploration Company had the title for free use as much as required (11.A), but Refining Company was to pay for each 1000 cubic metre of gas 5% of the weighted average of the posted price for one cubic metre of 37^{o}-37.9^{o} API crude oil of Agha-Jari quality f.o.b. Bandar Mashur, plus payment to Exploration Company of:

a) In the case of natural gas produced incidental to the production of crude, the cost of delivery of such gas from the field gas/oil separator to the refinery.

b) In the case of natural gas produced from a field which was primarily a producer of natural gas, the cost of production and delivery to the refinery of such natural gas (11.B.1) and in case of any disparity between the price of gas such used and the price of the same as exported (if any), adjustment by the Refining Company was necessary (11.C).

II.3.2. Operating fees, Royalties and Taxes. The Operating Companies charged the trading companies fees as follows:

a) Exploration Company one shilling per cubic metre of crude oil delivered;

b) Refining Company one shilling per cubic metre of crude oil refined (13.A).

Other costs incurred by an Operating Company payable to it included all costs of that Company such as proper allocation of administrative, overhead and establishment expenses, relevant fixed assets charges, depreciation of movables, transport and tools (13.B).

Apart from the operating costs paid to Operating Companies, the Trading Companies were to pay Royalties and Taxes. Royalty or 'stated payment' was the economic rent determined at the rate of 12½% of the applicable posted price of each crude (22.A) and in case of gas, a 5% of each Trading Company's posted price for one cubic metre of 37°-37.9° API crude of Agha-Jari quality f.o.b. Bandar-Mashur, for 1000 cubic metres of gas (22.C).

But there were normally reductions from the applicable posted prices and by 1965 they were reflected in the Supplemental Agreement as following:

> An allowance of 7½% of the applicable posted price to each quality and gravity, plus US \$0.0013235 per barrel for each full degree by which the gravity of such crude exceeded 27°API. In the case of the year 1966 and any year thereafter the maximum monetary amount per barrel of the allowance applicable to each quality and gravity of crude oil equalled 6½% of the applicable posted price plus US \$0.0026470 per barrel for each full degree by which the gravity of such crude exceeded 27° API,[1] all these rates being subject to reconsideration in the light of changing market situations[2] within a fixed range for fluctuations. [3]

1. Art. 4.E.2 of Supplemental Agreement, 1965.

2. Art. 4.F, ibid.

3. Art. 4.F and G, ibid.

NIOC had the option to take crude oil in lieu of all or part of the 'stated payments', valued at the applicable posted price (23.A), the aggregate quantity of which may not have exceeded $12\frac{1}{2}\%$ of the programmed quantity for any quarter.[1] Such oil was to be delivered f.o.b. tankship at any port, and was to be spread as nearly as was practicable evenly over each quarter, and at each loading port as nearly as may have been proportionately of the same quantity, quality and gravity as the crude oil delivered f.o.b. tankship at that loading port for the loading companies during each quarter.

The largest item of cost, however, consisted of the tax to Iranian government out of the net profits of the companies (then 50%), defined as the difference between its gross income earned in Iran, and the expenses related to earning such income <u>wheresoever</u> incurred.[2] After the tax was determined, a few other items were to be deducted from such tax in order to arrive at the tax paid. Those items were:

a) All stated payments.[3]

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1. In 1965, discounts were made applicable to the Royalty Oil as well as the oil lifted by companies, and Article 5 of the Supplemental Agreement provided that Royalty oil be valued at the applicable posted price less:
   a) the amount of the allowance applicable, on the date of each such delivery to NIOC, in the quality and gravity of crude oil so delivered to NIOC; and
   b) the sterling equivalent of $\frac{1}{2}$ US cent per barrel.

2. Income Tax Amendment, Art. 35.

3. In 1965, following the OPEC resolution, Article 35 of Iranian Income Tax was amended to expense royalty and to provide deduction of it from the net income instead of the payable tax (Art. 35(b), Annexture to Supplemental Agreement, 1965).

b) All operating costs of the Operating Companies including payments by the Operating Companies to affiliated companies or others for services actually rendered outside Iran, in connection with the operations in Iran of the Operating Companies.

c) Payments to the Operating Companies of their fees and reimbursements for the operating costs and expenses.

d) Office and other expenses of the trading company in Iran including salaries, wages, rents, office supplies and expenses of sales, including fees for brokerage and selling services performed outside Iran, the total amount of which deductions should in no event have exceeded a certain ceiling.

Moreover, to guard against any adverse competition by the other late-coming companies to Iranian oil, a 'most favoured clause' was built in the 1965 Supplemental Agreement, which provided that 'under <u>all</u> applicable agreements and the Iranian income tax legislation, the Consortium member was to enjoy the most favourable conditions available under any arrangement applicable to any other enterprise engaged in Iranian oil' (Art. 7, Suppl. 65).

Another item of payment which could potentially constitute a significant ingredient of cost, namely the customs duties, were actually nil. The Operating Companies enjoyed a comprehensive exemption from customs duties for all imports of equipment and consumer goods, and re-exportation of the same, without any licence and exempt from imports and other customs duties, charges and other taxes and payments (34.A).

The last point in this connection is the fact that all stated payments and all other payments of income tax were to be made in sterling, which affected different companies in different ways. Only operating expenses in Iran of the companies were to be made in Iranian currency, which was to be made available at the commercial bank rate of exchange, with fees or any similar device being reckoned as an integral part of the rate of exchange (31.A).

II.4. Inter-Company lifting arrangements. Consortium members, between them, signed an agreement in 1954 to regulate production and investment. The details of this arrangement were not known to Iranian authorities, not certainly until 1974.[1] The agreement provided that, in advance for each year, each member suggested an aggregate production quantity and the highest figure that was supported by 70% of the share-holding was adopted - Aggregate Programmed Quantity (APQ).[2] This quantity was then redistributed among the members proportionately to their holdings, on payment by each member (apart from payments in Iran) of only costs of about US 25 ¢/barrel - 15 ¢ for operations and 10 ¢ to BP - the latter to continue until

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1. Hearings, op.cit., Part 7, p. 568.

2. A penetrating analysis, in 1965, by Professor Penrose revealed some decisive factors in this arrangement, with surprisingly close approximations: See 'Vertical Integration', The Growth of the Firm, Middle East and Other Essays, 1971, pp. 200-217.

8.5 thousand million barrels had been exported, to compensate BP for assets given up in Iran.[1] Each participant was entitled to lift its equity share of APQ at tax-paid cost, and was further required to lift 75% - minimum - of its equity percentage share of APQ. A participant who did not lift at least 75% of its equity share of the APQ would pay by way of liquidated damages an amount calculated at the posted price less operating costs and fee for the amount of the short-fall. This sum would be divided among the other participants in relation to their respective liftings for the year.

The APQ was determined on an annual basis. The first step in determining the APQ would be taken in October when the Operating Companies advised the holding company of crude availability and the holding company reported to the participants the expected capacity of crude available for export in the coming year. In the case of Iricon members, all nominations were sent to Iricon who totalled them and forwarded the composite to the holding company.

The holding company divided each individual nomination by the equity percentage of the nominator to determine the total programme which would be required in order to allow the nominator to lift his equity percentage and receive his nomination. The total programme figures derived from each nomination were then listed in

1. Letter to Ambassador of US in Tehran - <u>Hearings</u>, Part 8, p. 568.

descending order of magnitude. The total programme figure of the participant whose lifting fell at or above a cumulative total of 70% of equity percentage became the APQ.[1]

The mechanism involved in this arrangement, provided against the over-lifters, in that the companies requiring excess oil had to purchase it from those who did not, at a posted price, and this at a period when posted prices were usually greater than market prices. However, initially when this arrangement was made, there were no significant disparities between these two prices, and this was the case for at least a few years.

The lifting arrangement would directly affect the capacity development, which would in turn determine capital expenditures. The method employed to set the capital expenditures was for the companies, when nominating their liftings for the APQ, to also forecast their proposed liftings for the following two years. Based upon these forecasts the Operating Companies determined the level of the expenditures needed to provide the production capacity to meet the forecast demands. The Operating Companies prepared a capital budget and work programme. This budget and work programme was submitted to the participants. The budget was approved by a 70 per cent vote of the members.[2]

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1. Hearings, Part 7, pp. 253-4.

2. Ibid., pp. 258-9.

The system made BP the sole arbiter of maximum production, but as to minimum production level, the 31 per cent of the equity holders could set the floor, and the 75% minimum-nomination obligation - the violation of which would incur a loss of capital costs as well as the margin between cost and nominal posted price, proportionate to the quantity under-lifted - does not provide, in my view, adequate guarantee that in a possible case of conflicting interests, some 31 per cent of shareholders collude to keep the production level down - though at their own expense, but administering serious losses to larger shareholders, for example BP. But as to the explanation of why such behaviour has not occurred at any point in time, one has to look beyond the mechanism built in the participants' agreement.

It is clear, however, that the mechanism has always produced an APQ below the estimated capacity, since at no time did 70 per cent of the participants nominate volumes which would represent their full equity percentage of 'available capacity', with the exception of 1967 - the year of Arab embargo. Besides, there has always been a gap between the 'technical capacity' and 'available capacity' as well as between the latter and 'physical takings', witness:

Years	1956	1957	1958	1959	1960	1961	1962	1963
APQs (million barrels)	188.7	251.6	287.4	320	348.3	415	490	555
Physical takings (m.b.)	182	245	278	314	356	397	448	499
Difference (m.b.)	6.7	6.6	9.4	6	-7.7	18	42	56

Years	1964	1965	1966	1967	1968	1969	1970	1971	1972
APQs (million barrels)	615	670	750	850	976	1102	1215	1450	1600
Physical takings (m.b.)	570	570	697	850	928	1053	1195	1414	n.a.
Difference (m.b.)	45	100	53	0.0	46	49	20	36	-

Source: Hearings, op.cit., Part 7, p. 278.
Extracted from data on attachment 2.

Normally, the terms of access to the oil in excess of APQ share, constituted a disincentive to the over-lifters, since they could lift the oil in excess of their respective PQs up to their equity share of capacity, at a half-way price. However, though there has been no occurrence of any company lifting less than 75% of its respective PQ, individual companies have at times lifted beyond their PQs, witness Exxon in 1967 who lifted 106% of its PQ.[1]

But why is that all member companies were not equally interested in some one APQ, or in an arrangement to eliminate the obstacles of over-lifting? The answer is a complex one based on the fact that each and every company is a unique entity as regards its internal resources and opportunities of growth; hence the difference in their strategies. But they all seek one thing: long-term profit maximization, viability and growth. But the process of growth, far from being smooth, is that of spurts

1. Hearings, Part 1, page 267.

and catch-ups, both inside and outside it. Inside the firm the factors do not change proportionately, in other words there is a 'heterogeneity of time' as regard each factor, and thus the outgrowing factor faces the tension of diminishing returns. Any such change, either inside or outside the firm disrupts the equilibrium and urges, through tension, the organization to strike a new equilibrium - hence the process of approximating dynamic equilibria. But there is some physical limit to this process, which hampers the dynamic, growing adaptation of some individual firms and that is the aggregate possibilities of growth - in a certain period - may be smaller than the aggregate opportunities of growth of individual firms added together.

Thus in a conglomerate such as the Consortium of Iranian oil, where rivals with different degrees and directions of integration in products markets, jointly produced oil but their equities differed, potentially many conflicts of interests could emerge in the face of some common interests, and thus the occurrence of cases where one or a few members would forgo a common interest in order to halt the competitive drive of certain rivals in products markets, was by no means ruled out. For an illustration of such potentiality the table overleaf is designed.

Obviously the members of Consortium had different stakes in these areas: for instance Exxon, Texaco and Standard of California each had a 30% equity in the lower-cost (as compared to Iran) oil of Saudi Arabia and had a 7% equity in Iran. Thus for them to have developed Saudi oil

Crude Production Cost for Selected Countries

(average for 1953-62)

Country	Development investment per unit capacity (amount per daily barrel)	Development cost (¢/B) at discount rate of: 15%	20%	Operating Cost
Iran	$ 275-325*	15	19	3 to 5 cents per barrel
Iraq	245-315	13-15	17-19	
Kuwait	225-285	12-13	15-17	
Neutral zone	405-435	20-22	26-28	
Saudi Arabia	205-265	11-12	14-16	
Libya	400-405	19-22	24-27	
Venezuela	575-895	32-47	49-60	

Source: Statements of Dr. Bradly, Hearings, Part 1, p. 286

* Which compares to $2,200-6,700 D/B in the USA, Adleman's estimate in "Oil Production Costs in Four Areas".

vis-a-vis Iranian oil, would have been more advantageous, *ceteris paribus*. And BP who had a 40% equity in Iran, and a 50% equity in Kuwait oil would have, at times, preferred to lift the maximum quantity in Kuwait and to turn to Iran as a second priority on the grounds that: a) Kuwait oil was lower in cost, b) by thus contracting the APQ in Iran some participants like C.F.P. who occasionally constituted a rival in the arms-length crude market would be subjected to disadvantage.

However, at one end of the scale are the countries jockeying for increasing revenues and the companies find it

Consortium Performance Comparison

Year	Consortium exports		Total Middle East production consortium member concessions		World oil production	
	MBD	Percent increase	MBD	Percent increase	MBD	Percent increase
1954	-	-	-	-	14,470	-
1955	303	-	-	-	16,185	(11.9)
1956	497	(64.0)	-	-	17,540	(8.4)
1957	672	(35.2)	3,526	-	18,495	(5.4)
1958	761	(13.2)	4,254	(20.6)	18,945	(2.4)
1959	860	(13.0)	4,579	(7.6)	20,485	(8.1)
1960	973	(13.1)	5,236	(14.3)	22,020	(7.5)
1961	1,089	(11.9)	5,586	(6.7)	23,480	(6.6)
1962	1,227	(12.7)	6,088	(9.0)	25,455	(8.4)
1963	1,369	(11.6)	6,626	(8.8)	27,405	(7.7)
1964	1,558	(13.8)	7,374	(11.3)	29,525	(7.7)
1965	1,695	(8.8)	8,001	(9.3)	31,700	(7.4)
1966*	1,890	(11.5)	8,800	(9.2)	34,355	(8.4)
1965 v. 1957		(152.2)		(128.6)		(71.4)
1966*v. 1957		(181.3)		(149.6)		(80.6)
Average % per annum*		12½		10¾		7.0

Source: Attachment to participants' note dated Nov. 16, 1966.

* Estimated.

embarrassing to develop their production unevenly and to the general disadvantage of some countries in a considerable period. The table shows the comparative performance of consortia of the companies operating in Iran and other countries in the Middle East.

As is seen, the consortium committed itself only to a development in line with Middle Eastern trend, whose range of variation was from 7.1% (in 1959) - minimum - to 23.6% (in 1957) - maximum, in a period of 13 years. And in the case of Iran, with significant deviations from the average ranged from the minimum of 8.8% (in 1965) to a maximum of 13.8% (in 1964).

Even from the point of view of every individual company, cost-consideration alone is not the sole factor to determine the scale of priorities, but a range of other factors such as 'quality', pattern of demands, pattern of refinery yields, transportation and storage facilities at the disposal of a company play a considerable role. And from the point of view of the combination of all these factors, every company is a unique entity, hence the difference in their priorities.

Thus the companies which considered in their best interest the more equitable access to the extra PQ oil, would have liked to see some favourable changes in the provisions of the agreement, to warrant (a) entitlement to equity share of total capacity, (b) taking at an equitable price of any extra oil availability arising from unlifted equity shares, (c) entitlement to take equity share of the APQ at cost plus equity share at cost of the difference between APQ and "available capacity", defined as 95% of 'maximum capacity', (d) the subjection of the actual taking of each participant to 75% minimum APQ obligation plus at least 90% of its elected quantity, the penalty of deviation being the payment of total producing company costs as if he had lifted 90% of his elected quantity, (e) making available the difference at APQ and 'Consortium's undertakings to Iran', at cost, on an equity basis among participants, (f) putting a ceiling on over-lifting, so that no participant could over-lift in excess of 15% of his equity share of available capacity.

II.5. Summary. Investment behaviour of member companies of Consortium was determined by long-term considerations of viability and growth. These include a variety of factors both 'outside' and 'inside' the industry.

I have explained the 'external' factors, as the sets of considerations of long-term prosperity as opposed to short-run profit-maximization. The coordination of the business attitudes of the companies with the general policy-lines of parent governments on sensitive issues, could constitute such a consideration. A second such broad framework was the provisions of the agreement that reflected the bargaining position of the parties to it, and as we have seen, proved to be an almost constraint-free, and flexible frames of action. A final such category of factors were those determining the cost of access to both intermediary and final resources.

Apart from those considerations, the most significant determinant of investment decisions was the terms of access of each individual company - as a unique pool of resources, driving towards a unique strategy - to the final product, which was influenced by the provisions of lifting arrangements in the light of the position of each and every company vis-a-vis its internal resources, market conditions and its strategic move at any point in time.

PART TWO

CHAPTER III

CAPITAL

CONCEPTS, DEFINITIONS, CLASSIFICATION AND METHODOLOGY OF MEASUREMENT

"... the point is though, not to be precise beyond the decent limits of precision."
J.P. Sartre

III.1 The necessity to define concepts of capital as a factor of production arises from the fact that planning must be based on the knowledge of the contribution to the product of each factor of production - otherwise no rational economic organization would be possible.

No doubt capital is an important determinant, and denominator of economic growth, but the intricacy of the process of production has made it possible to attach partial emphasis to any one factor of this complex whole. Arthur Lewis, for example, specified that increasing the rate of investment from 5 percent or less to 12 percent or more "is what is meant by an industrial revolution", and thus the economic theory of growth must explain an important problem, i.e. the process through which a society converts itself from being a 5 percent saver to being a 12 percent saver.[1] While others have emphasized the importance of the quality of labour-force.[2] Moreover, it is a fact that conventional quantity measurements of

1. Arthur Lewis, The Theory of Economic Growth, London, 1955, pp. 208, 225-6.

2. Hirschman, A.O., 'The Strategy of Economic Development' (Yale, Studies in Economics, 10). New Haven, Yale University Press, 1958, p.5.

capital do not tell an accurate story. Solow, for example, estimated that only $12\frac{1}{2}$ percent of the growth of aggregate non-farm production of the United States between 1900 and 1960 was attributable to increments of capital, while the remaining $87\frac{1}{2}$ percent was related to technological progress; that is technical embodiment of capital and the skill of the labour.[1] This compares with Fabricant's estimate that over the period 1871-1951, about 90 percent of increase in output per capita was due to technical change.[2] United Nations Economic Commission for Europe also emphasized the part played by 'technique and organization'.[3]

III.2 CAPITAL is defined as the stock of means separable from human beings and legally disposable in economic transactions, intended for use in producing goods or income.[4] This concept is limited in scope to increases in physical assets, net changes in stocks and durable improvements to land, preparation and extension of sites, pits and wells for extracting minerals and petroleum.[5]

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1. Solow, R.M., 'Technical Change and the aggregate production Function'. Review of Economics and Statistics, Vol.XXXIX, No.3, August 1957, pp. 312-320.

2. Fabricant, Soloman, 'Economic Progress and Economic Change', 34th Annual Report of the National Bureau of Economic Research (New York, 1954).

3. U.N. Economic Commission for Europe, 'A Study of Development and Growth in Europe During the Nineteen Fifties'. Memo. Econ. Advisers' Conference 113, dated 2nd March 1961.

4. Kuznets, Simon, 'Capital In American Economy, Its Formation and Financing'. NBER, 1961, p.15.

5. U.N. Studies in Methods, Statistical Series, F.No.3. N.Y. July 1953, p.8.

Items as education and health, skill and entrepreneurship are precluded by restriction of definition - rather than measurement complications - since these items are obviously qualities of labour rather than ingredients of <u>means</u>, i.e. capital. While exclusion of other intangible accountancy assets such as patents and goodwill from capital is explained by the fact that they are attributes of market-structure, natural resources and mines are left out because they are covered by <u>wealth</u>, and finally, omission of direct and indirect costs of financing capital formation is both because of data scarcity, and that different financing methods of enterprises lead to inconsistent results.

Conceptually all the 'means' mediating between the labour and its object are included in 'capital'. In practice, however, differentiation is made between 'capital assets' and 'items of intermediate consumption', i.e. items which do not live an economic life of more than an accounting period - usually one year. Such practical considerations, affect series of economic concepts as capital/output ratios (under-estimated), capital-productivity coefficients (over-estimated), and the rate of profit per unit of capital, etc.

As regards <u>LAND</u>, the rents and prices of which, as any other marketable item, depend entirely on buyers' and sellers' estimates of the net product of what can now and in the future be obtained from it, taken in conjunction with their estimates of alternative investment opportunities, it is generally agreed to leave it out of the concept of capital, and thus to restrict the concept to those requirements that are produced by human effort and have a cost of production. Therefore, all durable improvements to land such as drainage, levelling and grading, and building of roads and dams are included in the capital of the period when these improvements were made.[1] Such improvements, however, affect the price of land.

Thus with above restrictive characterizations, Capital Formation is the process of increases in stocks and gross additions to assets during a period of account, made up of the outlays of producers on goods which do not enter into the intermediate consumption of the period. Net capital formation is distinguished from gross capital formation in that it is measured after allowances are made for depreciation, obsolescence and accidental damages to fixed capital. Conceptually net capital formation represents the additions to fixed capital and working capital (Producers stock) available for future production.[2]

III.3 Numerous classifications exist for capital goods, appropriate for various purposes: (a) classification according to economic activity, or process classification,

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1. U.N. A System of National Accounts, Revised Version, 1968 p.110. See also; Colin Clark 'Capital Requirements in Agriculture - An International Comparison', Memeographical paper, Agricultural Economic Research Institute, Oxford, January 1967.

2. U.N. 'Studies In Methods', Statistical Series F. No.3 N.Y. July 1953, p.7.

as distinguished from classification of goods and services according to type, and regardless of the kind of ownership, type of economic organization, or mode of operation;[1] (b) Classification according to the structure of capital formation as to private, public and general government sectors of the economy;[2] (c) Classification according to the industrial use of capital goods such as 'agriculture, mining, manufacturing, etc; and (d) classification according to types of capital goods.[3]

The classification adopted in this study is the one according to types of capital goods, and covers 'general government' sector when compared with structure-classification (b, above), and 'mining, construction, gas and transportation' when compared with Industrial-use classification (c, above); while the process-classification which aims at a totally different purpose, does not compare with any of the above-mentioned methods, but helps identifying items to be classified under any of them.

The system adopted consists of the following categories of capital goods:

1. Buildings:
   (a) Residential
   (b) Non-residential

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1. U.N. 'Indexes to the International Standard Industrial Classification of All Economic Activities'. Statistical papers, Series M. No.4, Rev.2, Add.I. 1971. pp. 7-8.

2. U.N. 'Concepts and Definitions of Capital Formation', Statistical papers, Series F. No.3, 1953, pp. 17-19.

3. Ibid.

2. Construction:
   (a) Oil-construction
   (b) Non-oil-construction
3. Machinery and Equipment:
   (a) Machinery
   (b) Equipment
4. Transportation
5. Miscellaneous
6. Exploration

III.3.1.(a) 'Residential Buildings', is defined as the value of work put in place on the construction of buildings which consist entirely or primarily of dwellings; expenditure on major alterations in, and additions to, these buildings. Included are outlays on the external and internal painting of new buildings and on the installation of new permanent fixtures such as fixed stoves, central heating, air conditioning, lighting, plumbing and water-supply facilities, and all other fixed equipment customarily installed before dwellings are occupied and transfer and similar costs in respect of purchases (sales) of existing dwellings. Excluded are repair and replacement of worn-out or damaged fixed equipment and fixtures, and the value of the site of the buildings.[1]

III.3.1.(b) 'Non-Residential Buildings' is defined as the value of the work put in place on buildings and structures

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1. Any work put on the site is classified under 'Construction'.

which are entirely or primarily for industrial or commercial use; outlays in major alterations in, and additions to, these buildings and structures, and transfer and similar costs in respect of purchases (sales) of existing non-residential buildings. Examples of non-residential buildings are factories, warehouses, office buildings, stores, restaurants, hotels, garages, buildings for educational, recreational and similar purposes. Included are outlays on installation or alteration of fixtures integral to these structures, and excluded is the value of the land.

III.3.2. 'Construction Works' is defined as the value of work put in place on the construction of major alterations to land such as permanent ways of railroads, roads, streets, sewers, bridges, viaducts, subways and tunnels, harbours, piers and other harbour facilities, car parking facilities, airports, pipelines, oil wells and mine-shafts, canals and water-ways, water-power projects, dams and dikes which are not part of irrigation and flood control projects, aqueducts, drainage and sanitation projects, athletic fields, electricity transmission lines, gas mains and pipes, telephone and telegraph lines, etc. Included are the costs of raising the surface of future building sites, levelling the sites, and laying out the necessary streets and sewers.

A distinction is made here between the oil industry and non-oil-industry construction, on the ground that the former is directly related to the operations of the oil industry and cannot be put to other use, except at high sacrifices (if at all)- while the latter, though created for the use of oil industry, can at 'reasonable' sacrifices be adjusted to the utilization of non-oil sectors of the general economy.[1]

The former, generally, consists of construction of atmospheric benches, vacuum houses, gasoline facilities, jetties, gas distribution mains within the refinery, permanent link-up facilities for the manufacture of fuel, refining structures, anchorage for process units, tanks, pipe-lines, platforms for handling of oxygen cylinders, fuel oil tanker systems etc.

And the latter is, generally, composed of power-distribution systems, telephone-cables and exchanges, raw water-supplies, main external services, campus perimeter fences, car parks, roads, power mains, electrical networks, fencing of dwellings, sports-ground improvements, sports-stadium, micro-wave-systems, lighting systems, lorry loading systems, water tanks, vehicular access roads, weighbridges, provision of aprons at yards, sewerage systems, cycle ports, sun-shades, showers and eyewash fountains, tennis courts, etc.

III.3.3. 'Machinery and Equipment' is defined as the purchaser's value of additions of new and imported durable goods not elsewhere classified as fixed assets of the enterprise; their outlay on major alterations, improvements and renovations of these goods.

A distinction is made between Machinery on the one hand and Equipment and furniture on the other, on two criteria: possession of self-propelling-power, and a cost,

1. No doubt, in practice, it is difficult to draw a sharp dividing line between the two categories; hence the existence of certain borderline-cases whose classification in either category can be equally disputed.

exceeding five thousand pounds - (historical value). That is, any piece of machinery which is either fixed in a position and cannot be converted to another use except at a great cost, or contains self-propelling motor system, is classified under Machinery regardless of cost. Items which are of varied utility and easy to dismantle and ship, lack self-propelling-system and do not exceed 5000 pounds in cost, are classified as Equipment and furniture.[1]

The former - Machinery - is exemplified by: plumbite regeneration pumps, mobile plant (above £5000), portable telescopic foam towers, graving, crushing and screening plant, boilers in atmospheric crude distillation units, sulpher handling catalytic reformers, acid recovery plants, refinery ventilation and blowdown systems, container manufacturing plants, electric drinking water cooler, printing machines, dishwashing and sterilizing machines, packaging plants, drill and tapping machines, jet-cleaning machines, turbo-air compressors, main separators, fire hydrant system, fume scrabbers in continuous bitumen blowing units, depropanizer feed pumps, wire sling slicing machines, motors for sewerages, sulphur recovery plants, aromatic complex feed stocks, cranes, barrelling plants, generator set, etc.

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1. Although I have abstracted the criterion of 5000 pounds from a general observation of the range of all items, it is no doubt an arbitrary convention. George O. May applies the criteria of mobility, varying utility and transferability to distinguish 'Equipment', as against fixity and 'high' conversion cost of 'plant'. See his 'changes in the accounting treatment of capital items during the last fifty years' IN Problems of Capital Formation, Studies in Income and Wealth, Vol.Nineteen, NBER, Princeton Univ. press, 1957, pp. 193-214 (p.193).

While the latter - Equipment and Furniture - is exemplified by: switch-gears, storage tanks (below £5000), floating roofs on tanks, alternators at power stations, fire fighting facilities, air-conditioning, office furniture, typewriters, flexo-writers for materials integrated data processing, air-cooling units, meters, gas cookers, refrigerators, paper shredders, venetian blinds, heaters, storage tanks, tank level gauges, flowmatic controllers, mechanical handling equipment for jetties, laboratory equipment, test equipment, maintenance equipment, headphones, projectors and magnetic sound reproducers, pallets, maritime-radio equipment, fans, vibrate hand rollers, public address equipment, on-stream analyzers, driers, filters, teleprinters, microphones, lifts, thermal reformers, cameras, amplifiers, flow-recorders, etc.

Following the U.N. recommendations, parts shipped for assembly to make essentially complete machines or commodities and incomplete machines (i.e. an example of parts so far advanced that it already has the main essential features of the machine) assembled or unassembled, are not distinguished from the assembled complete machines themselves.

In general, parts which are clearly identifiable as specialized to, or mainly for use with, a particular machine or apparatus, or with a group of machines or apparatus falling within the same heading, are classified under the same heading as that particular machine or apparatus.

This rule, however, does not apply to parts which in themselves constitute a commodity covered by a particular heading; which are classified within their own appropriate heading even if especially designed as part of a specific machine or apparatus. For instance 'electric control panels, separately consigned, are classified as "switch-gear" even if they are specifically designed and intended only for use in electric locomotives'.[1]

III.3.4. 'Transport Equipment' is defined as purchasers' value of new and imported completed ships, aircrafts, railway and tramway rolling stock, tractors for road haulage, trucks, moving vans and the like, motor vehicles, carts and wagons, transportation fleet, marine fleet, etc. Included are outlays on major alterations and improvements in existing transport equipment of this type.

III.3.5. 'Miscellaneous' covers those marginal, un-identifiable items of expenditure which could not be classified under any of the above-defined headings and comprises items as 'releases from contingency funds', or 'adjustments' and 'round-offs'.

III.3.6. 'Exploration and Development Expenditure' constitutes a final category of classification. In strict accordance with the U.N. recommendations, only that part of discovery costs are to be included in capital formation series that involve expenditures for durable structures such as wells

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1. U.N. Commodity Indexes for the Standard International Trade Classification, Revised, Stat. papers, Series M. No.38, Vol.II.

and mine shafts.[1] Such treatment is based on the difficulty of adequately defining development expenses, some of which are probably very much like expenditures for research or education, which may serve purposes besides that of a specific capital expenditure.

The problem is though, that there is no one way of dealing with discovery cost practised throughout the world oil industry. Therefore, the practice varies according to general conditions of the industry, taxation laws and purposes of the industry: for example in many parts of the United States the expenditure sunk in dry-holes as well as intangibles such as labour and services are expensed[2] and the consortium of Iranian Oil producing companies used to expense to operating costs, the expenditure incurred by exploration and development, until 1962, inclusive.[3]

In Adleman's words, however, 'to have discovery costs out of the study would be Hamlet without the prince; to include it would put us to chasing his father's ghost: Tis here, ... tis there, tis gone.'[4] But the question is whether to include it in capital accounts. In keeping with the U.N. recommendations all development expenditures and

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1. U.N. Studies, op.cit., pp. 11-12.

2. Bradley, Paul, The Economics of crude petroleum production, North-Holland publishing Company, Amsterdam 1961, p.61.

3. Attachment to note No.3176, Tehran 26th January 1965, from Iranian Oil Exploration and Producing Company (IOEPC) to Ministry of Finance and National Iranian Oil Company (NIOC).

4. Adleman, The World Petroleum Market, John-Hopkins University press, 1973, p.6.

that part of exploration expenditures which ends in creation of structures, producing-wells and operational shafts are to be included in capital account, but the other part of exploration costs incurred by direct geological geographical and topographical survey parties ought to be left out of such account. The practical problem is however, that the exploration data are not available as to the above differentiation, and thus one is left with the option of either hazarding an estimate or including all, with the effect of some over-estimation of capital formation series. The latter course is taken in the present study, and the series have been adjusted retrospectively until 1954. The category is included in oil-construction series.[1] .

III.4.1 A variety of methods are in use for measurement of capital formation processes,[2] the applicability of any one, or any combination of two or more of them is conditional on the availability of data, and is determined by the purpose to which the results are put. However, in the case of an enterprise as modernized and technology-intensive as the oil industry which also employs highly

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1. Besides the classes of capital goods thus defined, a classifier comes across with some border-line cases where a combination of two separate categories is in order and they cannot be disentangled due to the lack of separate data. In such cases the combination is classified under the category which seems to weigh heavier in the whole. These cases which comprise about five percent of the aggregate capital, are almost offset between themselves; i.e. a definite quantity of 'Construction plus Machinery' classified as 'Construction' is eventually, wholly or partly offset by quantities of 'Machinery plus Construction' classified as 'Machinery'.

2. U.N. Concepts and Definitions, op.cit., pp.9-10. Also U.N. Studies ... op.cit., p.13.

developed systems of accounting, the first problem is that the data are guarded against jealously, and the second is that of definition and reclassification.

III.4.2. Both sectors of Iranian oil, namely Consortium - consisting of two Operating Companies - and National Iranian Oil Company (NIOC) kept separate accounts on an annual basis. A full annual record in the case of each industrial sector, i.e. producing, and refining, comprised the following;

a. Balance-sheets, and Annual Accounts
b. Comments on Annual Accounts
c. Capital Expenditure Report
d. Comments on Capital Report
e. Annual Budget Report

This tradition is being carried on in a more refined form since 1973 by Oil Services Company (OSCO); ABADAN Refinery and NIOC. Furthermore, there are 'project reports' carrying fuller details which are even less generously available.

III.4.3. The concepts according to which the primary sources of information are classified need be defined to make comparisons comprehensible. Each company divides its record of expenditures into two sectors: (a) Industrial expenditures (Basic, carried out by the Operating Company), and (b) auxiliary services (Non-basic carried out by NIOC). Either of the sector deals with concepts of 'Fixed Assets' and 'Movable Assets' as defined below.

According to generally accepted principles of accounting, the term "fixed assets" normally embraces movables as well. A distinction is drawn, however, in the 1954 oil agreement between (a) fixed assets, (b) movables, which include movable plant and equipment, mechanical transport, and drilling plant and tools.

Fixed assets comprise the following:

a) Assets which are permanently installed on land (including sea and river bottoms) the purpose and use of which does not entail movement from location to location or within a restricted location; and

b) Assets forming an integral part of the assets described in (a) above, or part of the permanent complement of fixed equipment required to commission and operate the assets described in (a) above; and

c) Additional or replacement assets for those described in (b) above upon installation of such assets, provided such replacement assets constitute improvements over the assets which they are replacing and therefore require to be capitalized.

Movables comrpise assets which are not confined to a particular location or which have no permanent installation or foundation and do not fall into the category of assets described above, including in particular assets the purpose and use of which entails movement from location to location or within a restricted location. The are classified as:

a. Sea and River-Craft and Equipment

1. Tugs and launches
2. Barges
3. Dredgers
4. Miscellaneous mobile equipment

b. Movable plant and Equipment (the function and purpose of which are essentially mobile)

1. Belt conveyors
2. Compressors, welding and generator sets
3. Concrete and pan mixers
4. Cranes
5. Fork-lifts
6. Pumps
7. Road rollers and road equipment
8. Tar-boilers
9. Tools - special purpose
10. Tractors
11. Miscellaneous equipment - self propelled
12. Camp equipment
13. Mobile radios, telephones, etc.
14. Fire and safety equipment
15. Geological and geophysical equipment
16. Public health equipment
17. Mobile clinics, X-rays etc.
18. Portable housing
19. Photographic equipment
20. Production and petroleum engineering field equip.
21. Surveying equipment

c. Drilling Equipment

1. Drilling and cementing equipment (includes draw-works and accessories, rotary table, drill pipes, crown and travelling blocks, hooks, swivels etc., mud tanks, cement heads, cementing tools, lifting subs).
2. Fishing and repair tools and equipment, (includes overshots, die collars, taps, etc.)
3. Derricks and accessories (includes masks, engine houses, etc.)

d. Aircraft and aviation equipment

1. Aircraft, all types
2. Aircraft equipment
3. Mobile airport equipment

e. Motor Transport

1. Light motor vehicles - having a maximum gross vehicle weight (G.V.W.) up to 12,500 lbs. (6 ton metric) (passenger cars, pick-ups, light buses, light-specials).
2. Medium motor vehicles - having a maximum G.V.W. up to 20.500 lbs - approx. 10 ton metric - (Labour-buses, platform trucks, typers, staff buses excluded).
3. Heavy motor vehicles, having a maximum G.V.W. over 20,500 lbs - approx 10 metric tons, (staff buses, labour buses, platform trucks, typers).
4. Tractors - all types
5. Motor cycle & side cars.

Note 1. All special purpose vehicles such as buses, ambulances and fire engines, fall into one or other of the foregoing sub-classifications.

The provision is made that where, in respect of any asset the classification cannot be determined under the above headings, reference to be made to their expected useful life; whereby assets having an expected useful life of ten or more years are classified as fixed assets and those having an expected life of less than ten years are classified as movables.

III.4.4. Thus it is obvious that the two sets of definitions are not reconcilable, i.e. the transportation category in the U.N. classification covers many sub-classifications of aircrafts, river-crafts or vehicles, and 'Machinery' covers many a 'movable' as well as 'fixed' plants. Hence the necessity of an entire re-classification, which made a thorough item-by-item study of the assets unavoidable. The procedure was to observe which item falls into the scope of what definition, and classify accordingly, leaving out the items which were excluded by definition - such as land.

The series thus prepared represent (a) actual construction of the physical assets, and (b) current exhaustion and obsolescence of capital goods. These, however, fall short of the economists' ideal of the statistics relating to the phases of development of capital assets yielding data (a) as to the economic life of the assets, (b) as to obsolescence due to the development of the new types of assets and innovation, and (c) regarding the market changes in the value of the monetary unit in which measurements are expressed. Finding practical answers to these questions is the subject of subsequent chapters.

III.5 Capital formation may be measured in terms of units of each type of capital goods: by weight, volume, horse-power, productive-capacity or by cost of the assets in current, historical, or constant monetary expressions. It may even be possible to convert one unit of measurement to another using appropriate conversion factors.[1] U.N. recommends that market-prices should be used.

The stage of valuation is another problem: since transactions which reflect capital formation as well as other economic activities are generally divided into a number of separate aspects which occur over time, it is possible to measure the transactions at one or another of its phases, e.g., orders, acceptance or orders by sellers, shipments, physical receipt of the item, issuance and receipt of invoice, date payment due, date of actual payment as well as time of installation of equipment or

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1. For a discussion on some theories of measurement and problems of valuation, see; Problems of Capital Formation, N.B.E.R., Nineteenth Vol., 1957, op. cit.

readiness of the structure for use. Since these phases of the transactions may extend over more than one accounting period, the choice of the phase will affect the totals of a period. U.N. proposes to adopt the rule of recording transactions at the time when the transaction is recorded as a liability or asset.[1]

This study follows the U.N. recommendations and records the annual expenditures regardless of whether a project is, or is not yet, complete.

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1. U.N. Studies, op.cit., p.12.

N.B. U.N. A System of National Accounts, op.cit., pp.110-115.

CHAPTER IV

DEFLATION

> 'Gold and silver vary in their value, are sometimes cheaper and sometimes dearer, sometimes of easier and sometimes of more difficult purchase .... But as a measure of quantity, such as the natural foot, fathom, or handful, which is continually varying in its own quantity, can never be an accurate measure of the quantity of other things; so a commodity which is itself continually varying in its own value can never be an accurate measure of the value of other commodities.'
>
> Adam Smith[1]

IV.1. In an economy, under conditions of equilibrium, the purchase-power of a unit of money, i.e. dollar, equals the sum-total of goods flowing in the market divided by the total number of dollars multiplied by the mean rapidity with which every dollar circulates. Thus an increase in the amount of saleable goods increases the purchase-power of money, and vice-versa, provided that the number of dollars flowing in the system remains constant and the mean velocity of every dollar stays unchanged. While a general increase in the total prices not compensated, or insufficiently

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1. Smith, Adam, 'An Inquiry into the Nature and Causes of the Wealth of Nations', 1937 ed., pp. 32-33. He is refuted on this point on the ground that a change in the 'value of money' would leave 'relative — prices' unaffected. See Marx, K., Grundrisse, Foundations of the Critique of Political Economy', Penguin, translated by Nicolaus, M., pp. 792-3. Marx's comment, however, is correct only in a static model, assumed by Smith, and does not aim at solving the problem of incomparability of 'relative prices' in two different points in time.

compensated, by a proportional increase in the amount of saleable goods or velocity of circulation, reduces the purchase power of money proportionally, and vice-versa. Also an increase in the velocity of circulation not offset by proportional increase of goods or reduction of money supply, has the same effect on the purchase power of a dollar as that of an increase in money-supply or a reduction of goods, and a slow-down of circulation not offset by proportional reduction of goods or increase of money-supply has the same effect on the purchase power of a dollar as that of a decrease in money supply or an increase of goods.

Therefore to make possible the measurement and comparison of the magnitudes of economies, different sectors of an economy, or an economy at two different points in time, one must stabilize the unit of measurement, hence the construction of the concept of 'constant prices'.

But how satisfactory a tool of analysis is this concept? Applied to an imaginery 'average good', or a single, homogeneous product such as items of wheat, corn, or goods of a similar gradation, variations in the total magnitude of prices reflect the proportional change in the magnitude of goods.

However the reality is far too complicated: goods are not 'average', or simple, and heterogeneity is rife. There are classes of goods, the relative prices of constituents of which do not stay stable or necessarily change in the one and the same proportion or direction. Thus the problem is that of appropriate grouping of goods which are either complementary or substitutable.

The classes of goods adopted for the purpose of this study consist of complex categories such as Buildings, Machinery, and Construction goods, which are subject to variations of composition as well as quality change. However, the assumptions are simplifying, in that, each substitutable ingredient of a class of goods is supposed to be homogeneous and the quality change is measured only to the extent that it is reflected in the price.[1] Besides, the validity of any price index rests on assumptions that: (a) the composition of each and every item in the category is 'reasonably' stable during the period of study, and (b) the relative weights of individual products in the category are also 'reasonably' stable.

IV.2. Indeed every student of economic measurements, specially those concerned with capital formation analysis have had to deal with the problem of deflation and index

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1. 'In the case of producers durable goods, only those changes in specifications involving differences in production costs between the old and the new type capital goods are generally taken into account. In such cases the adjustment is based upon the cost differential .... The situation for new construction is much the same. The deflated data make no attempt to reflect changes in the design and serviceability of structures or roads except in so far as they involve cost differentials. See Denison, E., 'Theoretical Aspects of Quality Change, Capital Consumption and Net Capital Formation', Problems of Capital Formation, NBER, Vol. 19, pp. 215-284. Also Jaszi, G., 'An Improved Way of Measuring Quality Change', Review of Economics and Statistics, 1962, pp. 332-335. The latter suggests an arbitrary way of quantifying qualities on the assumption that 'the new differs from the old only by embodying in new proportions qualities that have existed before'.

numbers. Surprisingly, however, the efforts of those analysing Middle-Eastern economies have not resulted in construction of the most needed series of deflators. The main problem for every one of them has been and continues to be the insufficiency of the appropriate data.

Julian Bharier, for example, in his efforts to make a capital formation assessment of Iranian economy, finds it 'impossible to produce estimates of capital formation in constant prices' as relevant deflators were not available. Nor does he find it feasible 'to construct a suitable deflator due to the lack of adequate information about unit-price'.[1] He decides therefore, that 'since in the period under study there have been massive bouts of inflation in Iran - amounting to hyper-inflation in the late 1930s and early 1940s - it is necessary to use a <u>general domestic currency deflator</u> to offset the considerable changes in the value of Rial'.[2] However, he emphasizes that the estimates in constant Rials were not equivalent to estimates in constant prices, as they only counteracted the distortions in domestic money values caused by internal inflation, and that they did not offset changes in the unit values of capital goods.

Samir Radwan in his study of capital formation in Egyptian economy, confirms Hooley's opinion that 'the use of domestic whole-sale price index as deflator may introduce new biases of serious magnitude'[3] but does not agree

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1. Bharier, J., <u>Capital Formation in Iran 1900-1965</u>, Ph.D. thesis, University of London (unpublished), p. 39, op.cit.

2. Ibid., underlining mine.

3. Hooley, <u>Capital Formation in Underdeveloped Countries</u>, p. 205.

with him on the point that 'the appropriate deflator is the price index of equipment in the exporting country', on the ground that while such an index accounts for an important part of price changes, it fails to account for that growing component of capital formation provided domestically and represented, in particular, by the cost of labour and building and construction materials. He suggests, therefore, that a better deflator would combine the different prices affecting capital goods prices: the price of capital goods imports in the exporting country, domestic prices of building materials and metals, and wages paid to local labour.[1]

Jawad Hashim uses Iraqi wholesale price indexes to build his own series, in accordance with Paache's base-year Price index formula. He thus makes: (a) a weighted combination of the official price index of building materials, and price index for cement, to construct his price index of building materials, (b) a compilation of data derived from import statistics, about machinery and equipment for his Index of Machinery, (c) a calculation of the c.i.f. value of imported furniture and fixtures, assuming that variations in the prices of domestically produced furniture and fixtures are similar to those of imported ones, and (d) an adjustment of the c.i.f. prices of imported transport equipment to take account of the changes of imports duties.[2]

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1. Radwan, Samir Mohamed, Capital Formation In Egyptian Industry and Agriculture, 1882-1967, Ph.D. thesis, University of London, 1973 (unpublished).

2. Hashim, Jawad, Capital Formation in Iraq, London School of Economics, Ph.D. thesis, 1965 (unpublished).

Thus they all have one fact in common: inadequacy of a systematic and consistent price data, and the difficulty of finding the relevant information in order to fill the gaps.

IV.3. A variety of methods are used for construction of price indexes falling in two broad categories: either evaluating both sets of products at one of the sets of prices, concluding change in <u>volume</u> of purchases, or multiplying both sets of prices at one of the sets of quantities, concluding change in <u>price</u> of purchases.

The most popular methods however, are Laspeyers' Weighted Aggregate Price Index with base-year quantity weights:

$$\frac{\sum_{1}^{n} Q_o P_n}{\sum_{1}^{n} Q_o P_o}$$

and Paache's given year method:

$$\frac{\sum_{1}^{n} Q_n P_n}{\sum_{1}^{n} Q_n P_o}$$

a modified form of which is called 'The Typical Year Method':

$$\frac{\sum_{1}^{n} Q_t P_n}{\sum_{1}^{n} Q_t P_o}$$

A combination of Laspeyers' and Paache's formula has resulted in Fisher's Ideal, which is the square-root of the product of both:

$$\sqrt{\frac{(\sum_{1}^{n} Q_o P_n)}{(\sum_{1}^{n} Q_o P_o)} \quad \frac{(\sum_{1}^{n} Q_n P_n)}{(\sum_{1}^{n} Q_n P_o)}}$$

The method adopted in this study is Laspeyers' modified formula:

$$I_{n/o} = \frac{\sum_{i=1}^{k} P_o^{\,i}\ Q_o^{\,i}\ [P_n^{\,i}/P_o^{\,i}]}{\sum_{i=1}^{k} P^i\ Q_o^{\,i}} \ .\ 100$$

$$= \frac{\sum_{i=1}^{k} P_n^{\,i}\ Q_o^{\,i}}{\sum_{i=1}^{k} P_o^{\,i}\ Q_o^{\,i}} \ .\ 100$$

where: k = number of commodities sampled

i = The commodity

$P_o^{\,i}$ = Average price of commodity i in the base-year

$Q_o^{\,i}$ = Quantity of commodity i in the base-year

$P_n^{\,i}$ = Price of commodity i in the year of study.

IV.4. There are four major classes of capital goods in our classification,[1] but in view of wide differences between the price variations of the items of each class,

1. For definition and coverage of each class of capital good see Chapter III above.

a separate series of deflators seemed to be more appropriate for each class of goods:

IV.4.1. Buildings; residential and non-residential.
In this context, the first problem is to determine the degree of validity of the available sources of data - Domestic Market prices - in the face of the fact that the oil industry as a whole (comprising Consortium and NIOC) have been purchasing an average of 89 per cent of their total requirements from the international markets.[1] Unfortunately, however, it was impossible to acquire detailed data of imports, in order to allocate the ratio of imported, and domestically produced goods and products forming each category. Nevertheless, I have assumed that the highest ratio of imports to domestically produced goods were placed in the categories of Machinery and Transportation, leaving the lowest ratio to the category of Buildings.

It is further assumed that the Buildings category has the same ratio of imported to domestic goods as an average modern building all over the country (12.37%), and thus a combined price-index of adequate number of building materials, and index of wages, can safely be used to construct an appropriate index for this category. Assumed is also that all the rest of the domestically produced goods went into the 'Construction' category, and that

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1. See Appendices 1 and 2 below, pp. 164, 165 below.

the other two categories did not have any share of domestically produced goods at all.[1]

The procedure is to select some 55 representative items of Building materials, and allocate their respective weights in the buildings of the base-year, and assume that the share of each and every item in the total, remained unchanged throughout the period of study. The selection of the year 1969 as the base-year rests on the simple reasons that (a) it is a 'normal' year unlike early sixties - years of depression - and mid-seventies - years of high inflation, (b) it easily compares with national accounts figures and Central Bank Studies which have already adopted the same year.

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1. For Shares of Buildings and Construction in the total GDFCF, and that of Buildings as percentages of construction, see Appendix 3 below, p.166.

Buildings: Residential and Non-Residential. Price Index

Year	Index
1955	81.01
1956	85.08
1957	83.48
1958	82.67
1959	83.19
1960	85.95
1961	82.90
1962	77.52
1963	74.72
1964	79.00
1965	79.10
1966	78.81
1967	82.38
1968	82.26
1969	100.00
1970	101.12
1971	101.18
1972	107.85
1973	129.26

For details see Appendix 4 below, p.167.

IV.4.2. Construction. A very wide range of goods and products are involved in the category defined as construction.[1] Fortunately a competent firm of Chartered Accountants, Haskins & Sells, has been preparing the price indexes of construction items in the Middle East for quite a considerable period. However, on the reasons referred to above, I have not considered it fit to generalize construction series to cover <u>all</u> capital formation in the oil industry, as oil companies seem to have done.[2] Thus, I have adopted the index series computed on the basis of Haskins & Sells' data, to the base-year adopted in this study.

As previously mentioned, it is assumed that the total of oil companies and NIOC purchases of domestically produced goods (11%) has gone into categories Buildings & Construction. Further, we also assumed that the ratio of foreign goods to domestic goods in the Buildings category of the oil industry is the average ratio of all modern buildings in the country (12.33%). Thus follows another assumption that the remaining part of domestically-produced goods, went into Construction, and constituted some 14.77 per cent of the category, and this compared to that of other Middle-Eastern countries and was accounted for by the Index.[3]

1. See Chapter III.

2. Part 4, Schedule 3, Annex 1 of 73 Agreement, p. 71.

3. The ratios are calculated on the basis of GDFCF data reported by Bank-e Markazi, Iran. See Appendix 3.

Construction: Oil and Non-Oil. Price Index

Year	1966 = 100	1969 = 100
1955	74.1	65.00
1956	79.0	69.30
1957	81.4	71.40
1958	83.8	73.51
1959	87.5	76.75
1960	87.5	76.75
1961	88.1	77.28
1962	88.9	77.98
1963	91.5	80.26
1964	94.2	82.63
1965	97.0	85.09
1966	100.0	87.72
1967	102.0	89.47
1968	108.0	94.74
1969	114.0	100.00
1970	117.0	102.63
1971	126.0	110.53
1972	140.0	123.80

Source: Part 4, Schedule 3, Annex 1 of '_Oil Agreement_', p. 71. Based on the data provided by '_Middle East Construction Price Factor Index_', prepared and certified by the firm of Haskins & Sells.

IV.4.3. Machinery and Equipment. In preparation of this Index, I have drawn exclusively upon the data provided by the U.N. Year Books of International Trade Statistics 1954-1975.[1] Much of the problem arising from substitution of items in the period of study, and inadequate comparability to warrant inclusion of the changed items in the defined groupings, is overcome by application of Standard International Trade Statistics Classification (SITC) since 1968. Such well defined data do not exist, however, for the years prior to 1968: the years 1963 - 1967 measure in terms of Metric Tons and Million Domestic Currency Units (Rials), and the year 1954 - 1962, inconsistently use the same metrics as 1963-67, while occasionally providing ad hoc numbers, traditionally used by Iranian customs.

To overcome the problem, the data on comparable definition are grouped together: 1954 - 1962, 1963 - 1967 and 1968 - 1974. Then after the Index numbers for each period were thus constructed, to provide for general consistency, the mean annual change of the years 1968 - 1974 is assumed to have taken place in the year 1967-68, and the mean annual change through 1963-67, to hold valid for the year 1962-63. Thus the conversion is made possible.[2]

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1. See Appendix 5, p.168A-D.

2. See Appendix 6, p.169.

Machinery and Equipment (in C.I.F. Prices)[1]. Price Index

Year	(a)	(b)	(c)	Index
1955	44.07			26.93
1956	82.49			50.40
1957	92.43			56.47
1958	89.10			54.44
1959	101.02			61.72
1960	103.21			63.06
1961	111.29			68.00
1962	100.00			61.10
1963		88.16		62.41
1964		84.99		60.17
1965		82.88		58.64
1966		96.35		68.22
1967		100.00		70.80
1968			84.35	84.35
1969			100.00	100.00
1970			110.05	110.05
1971			120.50	120.50
1972			118.68	118.68
1973			149.43	149.43
1974			180.81	180.81

1. Article 34 of 'Government Agreement' grants full exemption of customs duties for all Consortium imports.

IV.4.4. Transportation and Equipment. Sources, Method and Assumptions are the same as in IV.4.3.[1]

Transportation (in c.i.f. Prices)

Year	(a)	(b)	(c)	Index
1955	42.00			31.67
1956	104.30			87.63
1957	96.07			82.26
1958	~~104~~ 114.39			97.63
1959		91.77		81.96
1960		85.80		80.51
1961		91.14		85.53
1962		86.69		81.35
1963		100.98		94.76
1964		104.15		97.73
1965		108.36		101.69
1966		109.48		102.74
1967		100.00		93.84
1968			100.28	100.28
1969			100.00	100.00
1970			106.34	106.34
1971			126.67	126.67
1972			138.76	138.76
1973			123.14	123.14
1974			138.77	138.77

1. For detailed information see Appendix 7. See also Appendix 8, p.170 & 171, respectively.

IV.4.5. Miscellaneous

Miscellaneous items constitute something about one per cent of the total investment every year. In view of the nature of the category, no index number could be built to account for the price changes of such diverse articles. But since this contains some unidentifiable quanta of all the major groups, it appeared that a general Index number based on the series of four main groups could best account for it.

Index Number for Deflation of Capital Goods

Year	Buildings	Construction	Machinery & Equipment	Transportation	General Index No.
1955	81.01	65.00	26.93	31.67	50.59
1956	85.08	69.30	50.40	87.63	62.47
1957	83.48	71.40	56.47	82.26	66.02
1958	82.67	73.51	54.44	97.63	67.22
1959	83.19	76.75	61.72	81.96	70.81
1960	85.95	76.75	63.06	80.51	71.79
1961	82.90	77.28	68.00	85.53	73.99
1962	77.52	77.98	61.10	81.35	71.77
1963	74.72	80.26	62.41	94.76	73.59
1964	79.00	82.63	60.17	97.73	74.24
1965	79.10	85.09	58.64	101.69	75.17
1966	78.81	87.72	68.22	102.74	80.40
1967	82.38	89.47	70.80	93.84	82.43
1968	82.26	94.74	84.35	100.28	90.75
1969	100.00	100.00	100.00	100.00	100.00
1970	101.12	102.63	110.05	106.34	105.44
1971	101.18	110.53	120.50	126.67	114.32
1972	107.85	123.80	118.68	138.76	121.83
1973	129.26	145.26*	149.43	123.14	146.59
1974	146.89*	165.07*	180.81	138.77	170.74
1975	164.52*	184.88*	224.20*	155.42*	199.45
Wt. in 1969 of each group in general index	0.74	60.90	37.80	0.56	100.00

* These figures are estimated on the basis of Implicit Price Deflators of GDP as: 1973 = 88, 1974 = 100, 1975 = 112.

Source: Bank-e Markazi Iran.

CHAPTER V

DEPRECIATION AND OBSOLESCENCE

'All machinery is on an irresistible march to the junk heap.'

H.R. Hatfield[1]

V.1. Capital goods march toward the junk heap, they do not, however, die at once when they arrive at it, but lose value in the process of march: they depreciate. But there is a remarkable variance in this regard between the elements of capital: fuel is consumed and leaves no trace; raw materials vanish as they are only to transmigrate into the product; machinery, construction and buildings retain form so long as they remain a participant in the production process but lose serviceability.

Thus, constituent parts of the fixed capital assume varying life-cycles: machinery accompanies numerous processes of production, tools attend fewer processes, while fuel, lubricants and raw materials can appear only once. Therefore, the longer a machine lasts, the more is the magnitude of products over which its service spreads.

The wear and tear of a machine is not, however, necessarily proportional to its operational period. It is rather more economical to use a piece of machinery more intensively for fewer years than to use it less intensively for more years, because on the former case it employs more

1. H.R. Hatfield, '<u>Accounting</u>', New York, D. Appleton & Co., 1931, p. 130.

of the other factors of production and yields more returns, being less exposed to the loss through obsolescence, and better providing for renovation and updating.[1]

Depreciation thus conceived is a decline in value of durable capital from wear and tear over the accounting period, or alternatively equals that portion of currently produced capital formation required to maintain intact the 'stock of physical assets'.[2] In practice neither of these concepts is directly measurable without specifying the basis of valuation and definition of capital.[3] Because defining and measuring 'real' capital is almost impossible, the measures used have generally related to maintaining the constant monetary value of capital assets intact.

Thus, abstracting from changes in the patterns of supply, demand and technology, 'capital consumption can represent a reduction in <u>either</u> the physical ability of a capital good to contribute to annual production in the future, <u>or</u> in the remaining number of years it will continue to contribute to production. The net stock of capital is

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1. 'The idea that depreciation depends on intensity of use as well as on passage of time is so outmoded that the term "user-cost" has been appropriated to mean a cost that does not depend on use at all but only on time.' See: James Tobin, 'Comment to Robert Solow, Some Recent Developments in the Theory of Production' in 'The Theory and Empirical Analysis of Production' - <u>Studies in Income and Wealth</u>, Vol. 31, NBER, 1967, p. 51.

2. U.N. <u>Studies</u> ..., op.cit., p. 9.

3. Accordingly, depreciation may mean (a) decrease in value, (b) amortized cost, (c) difference in value between an existing asset and a hypothetically identical new asset, or impaired serviceability. For a discussion see: Bonbright, J.C., '<u>Valuation of Property</u>', New York, MacGraw Hill, 1937, Ch. 10.

the value of gross stock remaining after the deduction of capital consumption charges accrued since installation on all the capital goods remaining in stock.'[1] But measuring a 'reduction in physical ability' or 'contribution to production' - notions comparable to engineering concepts of depreciation - must eventually take a price form; either directly as the cost difference between the existing asset and a new one, or indirectly through accounting for higher costs of operation and maintenance, through shorter life-expectancy resulting in reduced contribution to production or through comparisons of more economical methods having become available. Thus even the physical concepts of usefulness must be expressed in money terms.

Besides 'normal' depreciation such as wear and tear, corrosion and decay which are relatively predictable, assets are also subject to certain unpredictable devaluations and hazards resulting in partial decay or termination of life.[2] The U.S. Treasury Department distinguishes two types of 'obsolescence' namely 'normal' and 'special' obsolescence.[3] By normal obsolescence is meant a kind of depreciation due to change in technology which results in

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1. Denison, F. Edward, 'Theoretical Aspects of Quality Change, Capital Consumptions and Net Capital Formation', Problems of Capital Formation, NBER, Vol. 19, p. 235.

2. Pigou makes a case for inclusion of obsolescence in capital consumption, see Pigou, A.C., 'Net Income and Capital Depletion', Economic Journal, June 1935, p. 239.

3. U.S. Treasury Department, Bureau of International Revenue, Bulletin 'F', Income Tax Depreciation and Obsolescence - Estimated useful lives and Depreciation Rates', Revised January 1942, p. 3.

producing identical goods for less cost, and the occurrence of the factors which can be anticipated with substantially the same degree of accuracy as other depreciation factors. Attempts are made to take into account this kind of depreciation, in estimating the 'normal life-expectancy' of the asset and thus to make allowance for it in the normal depreciation practices. But the latter is even more difficult to anticipate, such as revolutions in the techniques of production that may render uneconomical all the otherwise economical machinery and constructions, or a casualty such as fire, wreckage, or wars that may play havoc with the structures of capital and cause them to be written off prematurely. Obviously these hazards cannot be provided for any more than customary 'accountancy conservatism' may warrant compensation.

V.2. Counteracting tendencies

Under normal conditions, two kinds of counteracting tendencies operate against depreciation: the one is an expressional, or monetary one, while the other is real and value-augmenting. The former appears in two forms: (a) stock appreciation in capital assessments which reflect a change in the level of prices, rather than a change in the physical level of stocks. So when prices are rising, stock appreciation is positive and when they are falling, it is negative.[1] (b) Stock appreciation

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1. See Hibert, J., 'Modern Practices and Conventions in Measuring Capital Formation in National Accounts', in Aspects of Capital Investment in Great Britain 1750-1850, Ed. Higgins, J.P.P., Pollard, Sidney, pp. 11-32.

caused by computing the opportunity cost of capital or interest. However, it seems to be generally admitted that the phenomenon of interest, being an ex-post concept may not be used for assessment of future values of capital. Although, for a firm, interest is a cost deducted in arriving at profit, for an economy, interest is not deducted in arriving at net national product or national income.[1]

The second kind of appreciation is caused by constant maintenance and repair of capital goods. Without constant care and maintenance, machinery and construction deteriorate and stop short of running their 'normal' life cycles. Thus a permanent expenditure of services is required to maintain their serviceability. Conceptually any such expenditure is capital-augmenting, but in practice, a criterion of durability is laid down. Thus, replacements and repairs including expenditures which extend the normal life of the asset, or raise its productivity, such as 'major' alterations, renovations and rehabilitations are accounted as capital expenditures, while routine care like cleaning, oiling, adjusting and the replacement of short-lived parts are charged to operating costs.[2]

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1. Denison, E., 'Quality Change', op.cit., p. 248.

2. 'Increases in the costs of operation and maintenance and decrease in reliability of performance, accelerate the pace of replacement, especially in a growing economy.', see May, George O., 'Changes in Accounting Treatment of Capital Items During the Last Fifty Years', Problems of Capital Formation, op.cit., p. 200. Also Grant and Norton, op.cit., for a discussion of managerial barriers to economical replacements, pp. 27-28.

However, there is an element of arbitrariness in this criterion of durability - as is the case with many other practical devices of accountancy. Furthermore, it is not universally recognized.[1] The arbitrariness is still more in the case of repairs and alterations of buildings and structures, and in the criterion of 'maintaining their operating efficiency in the prior use to which they have been put, without involving an extension of its normal life'.[2]

V.3. Methodology

The method of depreciation is determined by pragmatic considerations of enterprise, i.e. (a) determination and distribution of profits (and that in periods of expansion or recession), (b) determination of income tax liability, (c) comparison of relative economics of alternatives, (d) establishing prices for products and services, (e) valuation for various purposes such as purchase, sale, insurance or returns to assessors for general property taxes, or (f) analysis of investment securities.

In general, business accounting practices tend to be rather conservative, underestimating the actual life

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1. U.N. Studies, op.cit., p.13, and U.N. A System of National Accounts, op.cit., p.113.

2. U.N. Ibid.

in service, and thus providing for unanticipated depletion. For an enterprise, this conservatism increases profits, depresses tax-liabilities and affects dividend policies, but from the point of view of general economy it may have different effects depending on the structure of the enterprise and that of market; under the conditions of 'perfect' competition, it depresses prices and sharpens competition, under 'oligopoly' or 'monopoly' it tends to boost prices and favours inflationary tendencies, while in the case of integrated enterprises, price-rises may be spread over all the industry and blunted.[1]

Broadly speaking, three categories of depreciation methods are in use: (a) methods based on time,[2] (b) methods based on use,[3] and (c) ad hoc methods.[4] But two methods have gained prevalence in both business and national accounts, namely, straight-line, and declining-balance methods. The idea is to distribute over the estimated useful life of the asset, in a 'systematic and rational' manner, the cost or other basic value of tangible capital assets, less salvage (if any). 'In no instance may the total amount allowed to be in excess of the amount represented

1. See Miller, John Perry, 'The Pricing Effects of Accelerated Amortization', <u>Review of Economics and Statistics</u>, 1952, p. 10.

2. Some time-based methods give smaller write-offs than stright-line methods, in early years, such as Sinking-fund or Present-worth method, while others give larger write-offs, in early years, such as declining balance method.

3. Exemplified by Production method.

4. Such as Retirement Revenue method, arbitrary write-offs determined annually by management, etc. See Grant and Norton, op.cit., pp. 185-190.

by the difference between the cost or other allowable basis and the salvage value, which may reasonably be expected to remain at the end of the useful life of the property in the trade or business.[1] Thus, the process is one of allocation, and may or may not properly account for the actual incidence of devaluation during the period.[1]

On the straight-line method, 1/nth of the value of an asset is charged against production in each of its estimated n years of life. On the declining balance method, it is assumed at the outset that an asset will never be entirely written off while it remains 'on the book', but that 1/mth of what is left at the beginning of each year will be used during the year. Thus, in the first year depreciation will be 1/m: the ratio left at the end of the first year will be (m-1)/m, and so the depreciation in the second year will be (m-1)/m,[2] and so forth, until the asset is sold or scrapped.

I have adopted the straight-line method, that is, group-method with zero scrap-value, as compared to item method. The reasons are: (a) that no method can be singled out as 'very accurate' but this one has the advantage of being simple, (b) that it is used both by Iranian

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1. U.S. Treasury Department, Bureau of Internal Revenue, Bulletin 'F', op.cit., p. 2. In practice, 'a plant' is maintained out of revenue in a state of efficiency corresponding to the normal progress of the manufacturing arts of the industry'. See Sanders, T.H., Hatfield, H.R. and Moore, '<u>A Statement of Accountancy Principals</u>', American Institute of Accountants, 1933, p. 35.

2. See <u>Accounting Research Bulletin</u>, No. 22, American Institute of Accountants, 1944.

Oil Industry and National Accounts.[1] Thus the general form of the formula is:

$$D_n = \frac{1}{L} G_n \quad {}^{2}$$

where D = Depreciation at the end of year n

L = Length of life estimate

G_n = Gross fixed capital stock, at the end of year n.

V.4. Estimation of Operational Life

The oil industry in Iran, depreciated Fixed Assets[3] in equal annual instalments over the years commencing from the 1st January of the year following the year in which the asset was first brought in use. However, additions and replacements to existing facilities which constitute improvements, but which do not add to the capacity of the original asset, was depreciated by reference to remaining period over which the original asset would have become fully depreciated.

Movable Assets[4] were depreciated in equal monthly

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1. In the case of general economy, there are many more complications to the measurement of depreciation. The case in point being that scrapping of the assets tends to be 'countermanded by their transformation into new assets of different types'. See Bharier, op.cit., pp. 44-45. The phenomenon is, however, in common with many 'developing' economies. See Ramamurti and Pederson, '<u>Capital Formation in ECAFE Countries</u>', p. 108.

2. The specific form of the formula is developed in Chapter VI below.

3. & 4. For definition as well as comparison of these categories with those adopted in this study, see Chapter II above.

instalments over varying periods, according to the class of movables to which they belonged, commencing in the month following the month in which they were received by the Industry. The life estimates were in the following order:

Class of movables	Life-estimates in months
Movable plant and equipment	36 - 60
Motor transport	36 - 60
Drilling equipment	60
Aircraft and aviation equipment	60
Sea and river craft	120 - 180
Other movables	36 - 60

'Exploration and Drilling' expenditure was depreciated in equal annual instalments commencing in the year in which the expenditure was incurred. Generally, exploration and drilling expenditure incurred prior to 20th March 1973, was charged to fully depreciate the expenditure by the end of 1979 and the expenditure incurred subsequent to 20th March 1973 was charged over ten years. In respect of abandoned wells in any area relinquished by the Consortium, the remaining undepreciated expenditure was charged to operating costs in the year in which the well was abandoned or the area was relinquished.

For the purpose of this study, however, having found the business practice unrealistic[1] and erratic,[2] I have drawn upon the available economic and engineering evidence.[3] Also, in view of the 'modern' character of the oil industry, I have found the findings of American Treasury Department, on Income Tax Depreciation and Obsolescence of 'new' properties, about the composite lives of buildings, constructions and machinery[4] reasonably comparable to my estimates arrived at through the expert advice. Furthermore, I found both of these estimated reasonably comparing with those adopted by Feinstein in his important study of capital formation in Britain.[5] All these estimates include some 'reasonable' allowance for 'normal' obsolescence , but do not contain any provision for 'special'

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1. Amir-Shahpour Shahin sums up the results of a questionnaire which was filled up by the Businesses in order to help allocate input or output items to economic sectors, which also contained a question regarding depreciation. 'Owners believed,' he says, 'that tools would be depreciated after two years, machinery after 10 years, and construction after 20 years, yielding a mean-weighted average of 18 years or 7 per cent per year.' See Shahin, 'Input-output Table for Iranian Economy', Ministry of Economy, Statistical Bureau, 1965, p. 29.

2. I have given a graphical illustration of depreciation series resulted by this study as compared to the one calculated by the British Petroleum, see Chapter VI below.

3. I have consulted many economists, surveyors, accountants and engineers in Ahwaz, Abadan, Tehran head office, as well as in Consortium's London Head Office and British Petroleum.

4. American Treasury Department, Bulletin 'F', 'Income Tax Depreciation and Obsolescence of New Properties, 1942.

5. See Feinstein, Domestic Capital Formation in the United Kingdom, 1920-1938, pp. 80-82.

obsolescence. Thus arrived at, my weighted average estimates are in the following order:

Classes of Capital Goods	Life Estimates in Years
Buildings	60
Constructions	30
Machinery	20
Equipment	5
Transportation	20
Miscellaneous	3

CHAPTER VI

IRANIAN OIL INDUSTRY

FIXED CAPITAL: STOCK FLOW; DEPRECIATION AND GROWTH

VI.1. Having examined some aspects of the apparatus and mechanisms through which investment decisions are made (Ch. II), and having defined the concepts and criteria for identification and classification of capital goods (Ch. III), and finally having established the appropriate deflator series for each class of capital goods, I aim in the present chapter to present the Annual Fixed Capital data in both current and constant prices. Furthermore, I wish to illustrate the structure of the capital stock in terms of well-defined categories, and to suggest an idea of the weight of each category in the total capital (in graphs). All this is done in section one of this chapter, while section two deals with the formation of capital stock.

A number of points must be elucidated before the series are made to speak for themselves. The first is why the data are presented in terms of US Dollars while the original data were given in terms of pounds sterling (Consortium 1954 to 20th March, 1973), US Dollars (Consortium Sector since 21st March, 1973, and all Iranian economic data for purposes of international comparison), and Iranian National Currency, Rial (NIOC, 1956-1975).

To explain, a glance at the following facts will help: the foreign sector of Iranian Oil, following the 1954 Agreement with the government (Ch. II) decided to keep all financial data in terms of pounds sterling, notwithstanding the fact that all the member companies operated in more than one country - with possible exception of some American non-majors who between them command five per cent of the whole operation - and consequently their financial transactions involved a variety of conversion rates. This practice was carried on since October 1954 to 20th March, 1973, while Iran received a growing share, and later a dominant share of her oil money in terms of dollars, and accordingly, settled the import bill for capital goods (an average of 88% of the total investment) in dollar-dominated foreign exchange.

From 20th March 1973 onwards the same sector continued to operate under a different administration, i.e. Oil Services Company (OSCO), and decided to keep the financial records in terms of US dollars. However, to secure continuity, a code of conversion was agreed upon by the parties, following the Geneva Agreement of 20th January 1972, based on the 'simple average of daily rates' for the period provided by the National Westminster Bank Ltd., London, as follows:[1]

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1. Paragraph 3(a)(1) of the Geneva Agreement dated 20th January, 1972, in Part 4, Schedule 3 of Annex 1 of 73 'Agreement' between the Government of Iran and Oil Companies.

1954-1966	£1 =	US $2.80	=	Rials	196
1967	£1 =	" 2.70	=	"	189
1968-1970	£1 =	" 2.40	=	"	168
1971	£1 =	" 2.41	=	"	168.7
1972	£1 =	" 2.50	=	"	175
1973 (until March 2oth)	£1 =	" 2.43	=	"	170.1

The rate for 1973 is calculated from monthly average parities of Iranian Rial vis-a-vis foreign currencies.[1]

Along with this practice, the National Iranian Oil Sector, which has been assuming a growing share in the investment, kept the financial records in Rials and Dollars, and the import bill was expressed in both currencies converted at the ruling rate of exchange. Notwithstanding the practice, the internal currency expression seems rather arbitrary since some 88 per cent of total capital goods were paid for in foreign exchange.

Therefore, it seemed clear that either Dollars or Pounds ought to have been chosen as the unit of expression while the choice of either would have necessitated re-conversion of part of the data and the undesirable introduction of conversion-rates complications - which was there anyway. But the Dollar seemed to command the additional advantage that it is the measure of account in the large 'Oil Services' sector of Iranian Oil today,

1. Bank Markazi Iran, Annual Report 1973, Table 58.

in the same way as it is the international expression of Iranian National Accounts for purposes of comparison.

A second point is that due to variations in the accounting procedures of the oil industry, as well as the changes in 'commodity definitions', and due to the absence of the detailed data to allow a clear classification of each capital goods group, it was not possible to determine the composition of the Fixed Capital for purposes of running the technical side of the industry (Basic) and auxiliary requirements (Non-basic) for the period 1955-1957. Thus the assumption was made that the share of each category during that period was the same as in the later period of 1958-1960.[1]

* * * *

With this clarification, the Investment stream tables can tell their own stories:[2]

Table 1 provides a detailed set of data regarding the stream of annual investment in Buildings, in

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1. The average share in percentages for the period 1958-1960 is as follows:

	Basic %	Non-basic %
Buildings (a) Residential	-	70.75
(b) Non-residential	5.10	12.30
Construction (a) Oil	50.50	-
(b) Non-oil	3.56	5.60
Machinery & Equipment		
(a) Machinery	19.06	1.85
(b) Equipment	11.50	7.80
Transportation	6.74	-
Miscellaneous	3.54	1.50
	100.00	100.00

2. All tables 1-92 comprise appendix 9 below, pp.172-265.

both areas of producing and refining of foreign sector of Iranian Oil. The data are further split into Basic and Non-basic Installations, and furthermore, give the total amount invested in Residential and Non-residential buildings, as well as their grand total. Table 2 gives the same data in constant 1969 dollars.

Tables 3 and 4 provide the data regarding construction, in the same way as Tables 1 and 2 above.

Tables 5 and 6 deal with the detailed data about Machinery and Equipment, in a similar order.

Tables 7 and 8 supply the information about investment streams of Transportation, and Tables 9 and 10 are concerned with unidentified data classified as miscellaneous, in the same order as the other tables.

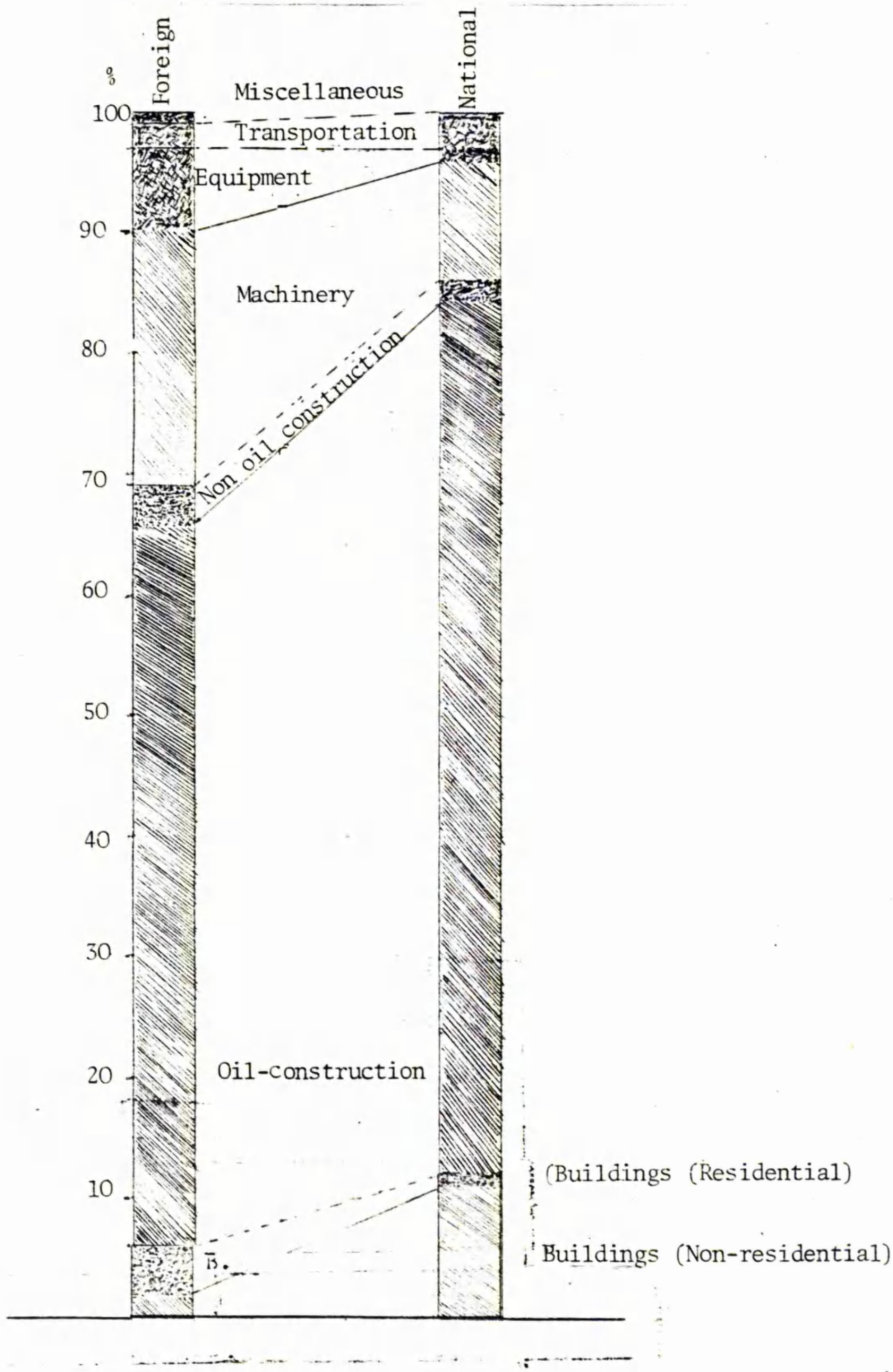
Tables 11 and 12 sum up the total annual investments on all categories of the total Annual Capital, and give the grand total of every year's investment.

Tables 13 - 22 provide the detailed data of capital streams in all classes of capital goods, in NIOC sector, in a similar order to above.

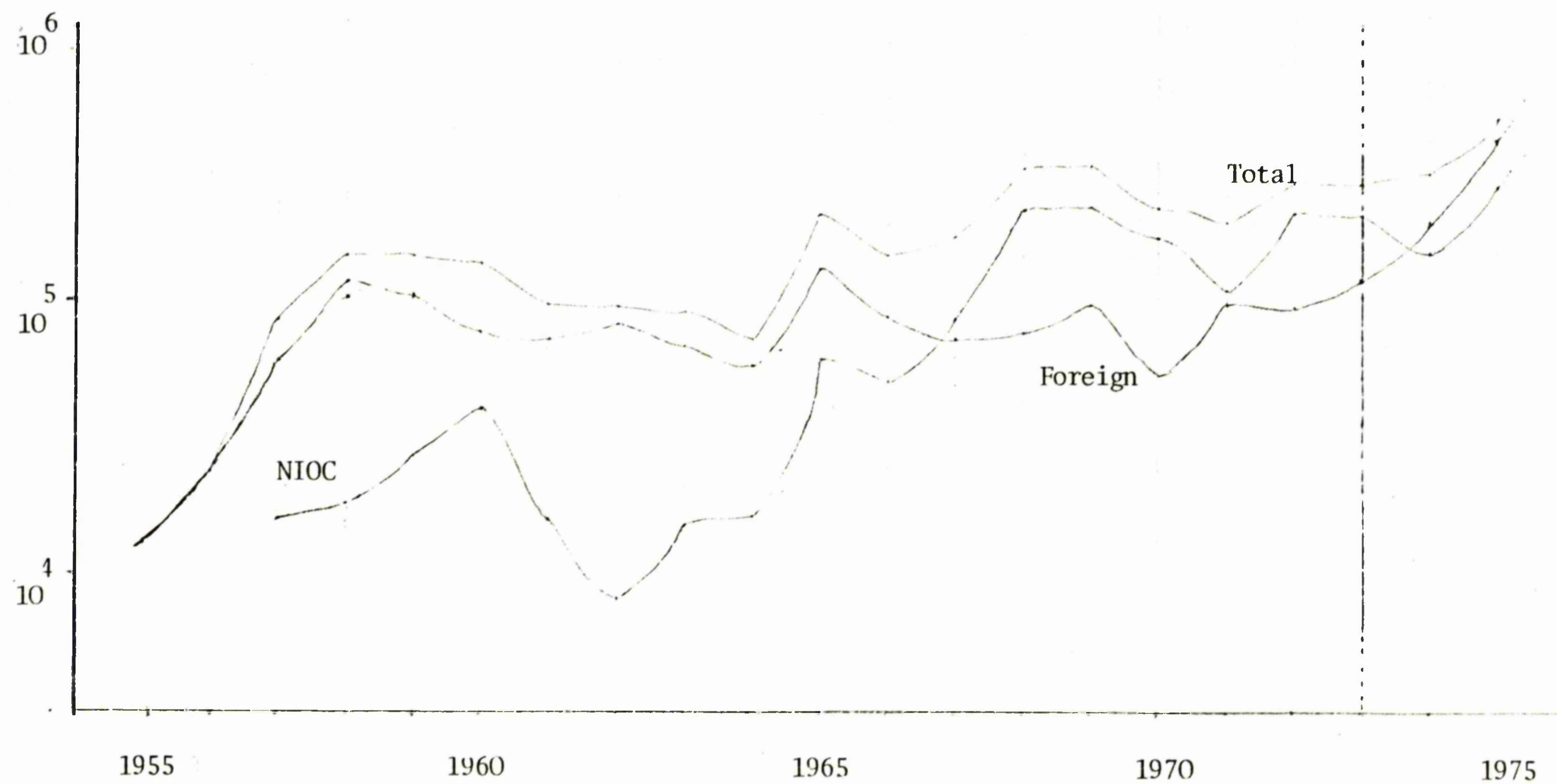
Finally, Tables 23 and 24 sum up the total investment streams in both administrative sectors of Consortium and NIOC, and Industrial Sectors of Producing and Refining, following the format of previous tables.

AVERAGE ANNUAL INVESTMENT

Constituents as Percentages of the Whole
Composition of fixed Investment Flow in
Iranian Oil Industry (1955 - 1975)

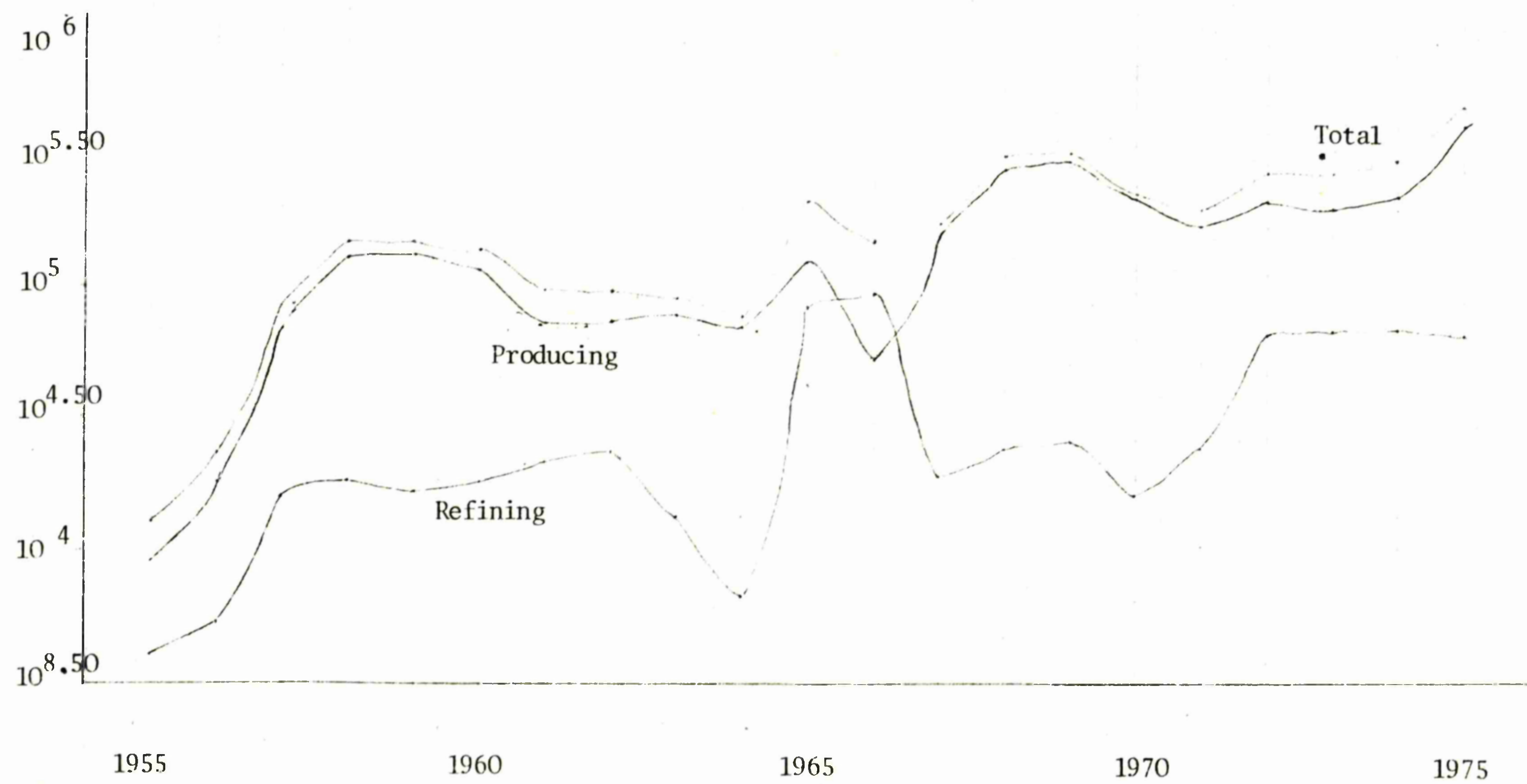


Source: Tables 12 & 22, Appendix 9, pp.184 & 194.



Source: Table 24, Appendix 9, p.196.

FIXED CAPITAL: ANNUAL INVESTMENT
Foreign & NIOC
(000 $) Constant 1969



Source: Table 24, Appendix 9, p.196.

Fixed Capital: Annual Investment. Production & Refining (000$) 1969 Constant

II

> The role of capital stocks in empirical estimates of production relations is akin to that of a minor vice - we all know there is something wrong with it but persist in the practice for lack of a better substitute.
>
> Gort and Boddy[1]

V.II.1. Assumptions. In measuring the stock of capital and its movement through time one has to resort to sets of concepts such as 'optimum life-time of capital goods', 'depreciation and obsolescence' that at their very best can only claim the stamp of 'reasonableness'. Therefore the accuracy of measurement and precision of computations are partly offset by the inaccuracy of the assumptions.

To prepare the time-series, the following assumptions are made:

1) The stock on the first day of 1955, of the Producing Company (£42,340,000), and the Refining Company (£23,710,000), assume the same composition of capital goods as the investment composition of a subsequent period of 1955-1964 in the following order:

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1. Michael Gort and Raford Boddy, 'Vintage Effects and the time-path of Investment in Production Relations', Studies in Income and Wealth, Vol. 31, pp. 395-430. Also Daniel Creamer, 'Measuring Capital Input for Total Factor Productivity Analysis: Comments by a Sometime Estimator', Review of Income and Wealth, 1972, pp. 55-78.

	Producing %	Refining %
Buildings	10	25
Construction	59	15
Machinery	15	30
Equipment	9	20
Transportation	5	5
Miscellaneous	2	5
	100	100

2) The stock on the first day of 1955 (for Consortium) and 1957 (for NIOC) were half-lived. Thus it follows that they should be depreciated by double the rate of depreciation (2r).

3) The investment made through the year is assumed to have been made at the mid-point in time so that by the end of the year both the first and the last item of investment are only half-a-year old.

4) Disinvestments are made at the average age of the capital item concerned, therefore they do not affect the age composition of the capital stock.

5) In the case of the Iranian Sector of the enterprise (NIOC), since no record of the first-year-stock was available, one could only search for a 'safer' assumption. One such assumption seemed to be that the ratios of stocks in the time zero (S_o) to the magnitude of investment during the first five years of operation, in both NIOC and Consortium, could reasonably be taken to have been equal, i.e.

$$\frac{S_o \text{ NIOC}}{\sum_{t=1}^{t=5} I} = \frac{S_o \text{ Consortium}}{\sum_{t=1}^{t=5} I}$$

A second alternative was to pick up the earliest available data for net stock in NIOC records, which belonged to the year 1958, and make allowances in order to approach the stock in the time zero. This, however, would have involved the complication of a different procedure of depreciation.

A third way which was preferred on the ground of its straight-forwardness, and compatibility with the results of both above-mentioned procedures, was to adopt the 25 million pounds sterling paid by the Iranian government to the British Petroleum in compensation for the nationalization of its assets in the non-consortium area, and make an estimation of the proportion of the capital formed in NIOC internal oil distribution network, and thus arrive at the capital inherited by NIOC in all its operational area. This procedure led to a 20 per cent share of stock for NIOC Producing and Refining activities as compared with 80 per cent for its distribution network.

6) The stock thus estimated is divided between producing and refining processes in the same proportion as that of investment composition of 1964-1975, and assumes average capital composition of the same period, as below:

NIOC Stock in 1956

(in 1969 $)

	Producing	Refining
Buildings	552,890	1,421,720
Construction	12,109,090	2,840,404
Machinery	1,335,700	1,578,553
Equipment	30,357	91,070
Transportation	460,116	19,170

7) The pattern of investment in Producing and Refining processes during the period 1959-1963, for which no direct data was available - was the same as the period 1964-1975.

8) Capital goods structure of annual investments during the period 1957-1963 compare with that of 1964-1975.

V.II.2. Concepts. 1. Gross Stock.

In a growing economy, capital goods are replaced and supplemented at a faster rate than they deteriorate.[1] An enterprise accumulates depreciation funds before it has to make replacements. Once the reinvestment is made, the operating capital is enhanced in terms of performance, although the net stock remains unchanged by definition. This is explained by the fact that properly maintained

1. Implications of this are discussed by E.D. Domar, Depreciation, Replacement and Growth, Economic Journal, LXIII (March 1954).

capital goods often decline less in proportion to depreciation. The only index of this slackening performance is the growing age of capital items. Gross stock, thus, grows steadily until it suffers a setback from a sudden retirement of initial investment, after which it assumes a fluctuating course.[1] The assumption embodied in this concept is that the performance of capital goods remains unchanged during its life-time. Gross Stock is expressed as

$$S_{t=n} = \sum_{t=0}^{t=n} I - \theta$$

where $S_{t=n}$ = Stock in year n

I = Annual investments in constant dollars

θ = Retirement after the termination of life-time.

V.II.2.2. Depreciation

This concept is a function of the optimum 'life-time'[1] of capital goods, the age-distribution of capital equipment, and entrepreneurs' investment horizons.[2] Under certain conditions where current replacements fall short

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1. See graphs illustrating gross stocks in Sheet 1. Also compare illustration of Hans Neisser and E. Grosswald, 'Gross Capital Stock and Net Capital Stock, the Simplest Case', Review of Economics and Statistics, 1960, pp. 94-96. Obviously, what makes Neisser-Grosswald graphs fluctuate more dramatically is a simplifying assumption of a simple, identical conglomerate capital.

2. Thomas Iwand, elaborates on some of these factors in 'Models of Capital Accumulation and Economic Instability', Review of Economics and Statistics, 1961, p. 54.

of depreciation (in terms of performance) and where straight-line method of depreciation is applied, and the funds thus raised are immediately reinvested, a 'multiplier effect' might be operational.[1] Domar has elaborated on some specific data to the conclusion that under the above assumptions in an exponentially growing economy, the ratio of the depreciation to replacement at any given time is a definite function of the rate of growth and the average lifetime of the assets.[2]

In this study, a straight-line method of depreciation is applied. All pre-1955 (for Consortium) and 1957 (for NIOC) stock is assumed to be half-lived at time zero, and are depreciated by double the annual rate (2r) and every item of the investment in year n is assumed to be half-a-year old by the end of the year n, and is consequently depreciated by half the annual rate ($\frac{1}{2}$r). Thus we have:

$$D_n = r[2I_o + (\sum_{t=1}^{t=n=L} I) - I_n/2]$$

where: D_n = depreciation in year n

r = rate of depreciation (1/L)

I_o = investment in year zero

I_n = investment in year n

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1. B. Horvat spoke of this effect for the first time in his The Depreciation Multiplier and a Generalized Theory of Fixed Capital Assets, The Manchester School (1958), and later developed it in Towards a Theory of Planned Economy (Yugoslav Institute of Economic Research, Belgrade, 1964), pp. 140-148. See the article by P. de Wolff, 'The Depreciation Multiplier', Review of Economic Research, 1966, pp. 412-418.

2. E. Domar, 'Depreciation, Replacement and Growth', Economic Journal, 1963 (March 1953), pp. 1-33.

V.II.2.3. Net Stock

This economic entity is a function of Gross Investment, depreciation and obsolescence, with gross investment being a derivative of entrepreneurs' expectations of future cost and demand conditions.

Abstracting from the variations in scale, the rate of net investment is definitionally determined by the rate of technological change: the faster the rate of innovation, the higher the rate of replacement due to obsolescence.[1] However, the rate with which innovations can be injected into an existing body of capital structure is limited by the choice of previous techniques.[2]

Net Stock is measured in this work as:

$$S_o = I_o - D_o \ .$$

where: S_o = Stock in time zero

I_o = Investment in time zero

D_o = Depreciation in time zero.

Thus:

$$S_1 = S_o + I_1 - D_1$$

$$S_2 = S_1 + I_2 - D_2$$

1. Benton F. Massell elaborates on this, see: 'Capital Formation and Technological Change in the United States Manufacturing', Review of Economics and Statistics, 1960, p. 188.

2. M. Gort and R. Boddy attempt an analysis of the restriction imposed on investment in modern techniques through an already existing structure, see: 'Vintage Effects and ...', op.cit.

Finally: $$S_n = S_{n-1} + I_n - D_n$$

which expressed in terms of Annual Investments, yields:

$$S_N = \sum_{1}^{N} I - [2NI_o + \sum_{1}^{N} I_n . r \frac{2N-(2n-1)}{2}]$$

where: S_N = Stock in year N

I = Annual Investments

N = Number of capital formation years within the range of the life-time of Capital-good in question

n = The annual order of the Investment (I) since the year zero

r = Rate of depreciation.

V.II.2.4. Age Index (γ)

This index simply shows how old a capital-good is at any point in time. In other words, this concept expresses in terms of time what depreciation does in terms of money, and moves in opposite direction to the Gross Stock, thus reflecting a possible slackening in performance of capital equipment due to passage of time. This, however, is by no means any clearer an indicator of serviceability than depreciation, and there is no evidence that ageing affects the performance of capital goods in a linear way.

The concept embodies the assumption that every class of capital goods has an 'optimum' operational time (life expectancy), at the end of which the piece must be discarded. In other words, the life-time is not subject to random fluctuations and not dependent on the intensity of use.

The measurement runs on the assumptions that the investment of the year t_o, on the first day of the year t_1, is of zero age. By the end of year t, it becomes one year old. But the investment made during year t_1 is only half-year old by the end of it. Thus at the end of the year n, within the life-expectancy of capital goods, the investment of the year zero is n years old, and investments of years 1, 2, 3 ... and n, are $n-\frac{1}{2}$, $n-1\frac{1}{2}$, $n-2\frac{1}{2}$ ... and $n-(n-\frac{1}{2})-\frac{1}{2}$ years old respectively.

Thus we have:

$$\gamma = \frac{\sum_{t=0}^{t=n} L.I}{S_{t=n}}$$

where: γ = age index in year n

L = life expectancy of every class of capital goods in year n

I = investment in constant dollars

S_t = Gross Stock in year n

V.II.3. The Order of the Data

Tables 25 - 59 contain the detailed information about the formation of each class of capital goods in terms of gross and net stocks along with the age index at every point in time of the capital goods in question.

There are separate tables for Consortium and NIOC, as well as for industrial sectors of Producing and Refining.

Tables 60 - 65 present the accumulated investment data (nominal stock) of all items of capital goods, in separate sectors, and suggest the nominal magnitudes of investments frequently referred to in the literature. These series are definitionally cumulative since they do not reflect depreciation and retirement.

Tables 66 - 71 present the data for gross stock in all items in every single year (as does the sheet No. 1 of the graphs). I have indicated the significance and implication of this time-path of gross stock in V.II.2.1 above. I have also mentioned the reasons for the time-path as it is, and its resemblance as well as difference with the findings of other works. The higher growth rates of the gross stock in NIOC sector is obviously a function of higher annual investments.

Tables 72 - 77 present depreciation for each class of capital-good every year and Tables 78 - 84 give the net stock data as calculated for every item of capital goods. (See also Sheet No. 2 of graphs, and the margin between the gross and net stock curves in Sheet No. 1 of graphs). When depreciation exceeds annual investment, there is a negative net investment (see Sheet No. 2) and accordingly, the net stock curves decline (compare Sheets No. 1 and No. 2). It is observed that depreciation has been lagging behind the current investment for most of the time in producing sectors and thus the stocks registered positive growth. This has not, however, been the case in refining sectors, particularly in the refining operations of the foreign sector. Thus the net stocks of foreign refining operations have stayed almost constant within the vascillating margins, while the net stocks of NIOC refining operations have grown steadily and vigorously (see also Graphs on Sheet No. 1).

Tables 85 - 88 contain the age-composition data of capital items as well as that of the conglomerate capital every year. They also give age-expectancy and a percentage expression of the capital-life passed away (see also Sheet No. 5). These series are supplementary to that of depreciation, in that they reflect in terms of age what that of depreciation do in terms of value. Thus the 'younger' the capital stocks, the less remote from the technological requirements of the industry,[1] and the more 'life expectant' they would be. The larger bulks of new investments, the younger the capital stock. Thus the capital stocks in NIOC sector which have, throughout, enjoyed higher rates of growth, are far less aged than those of the Consortium.

Tables 89 - 90 carry net-stock rates of growth, that is the growth of every year's stock on the basis of a previous one. Time-path curves of the net stock (Sheet No. 1) also help illustrate these rates. The producing

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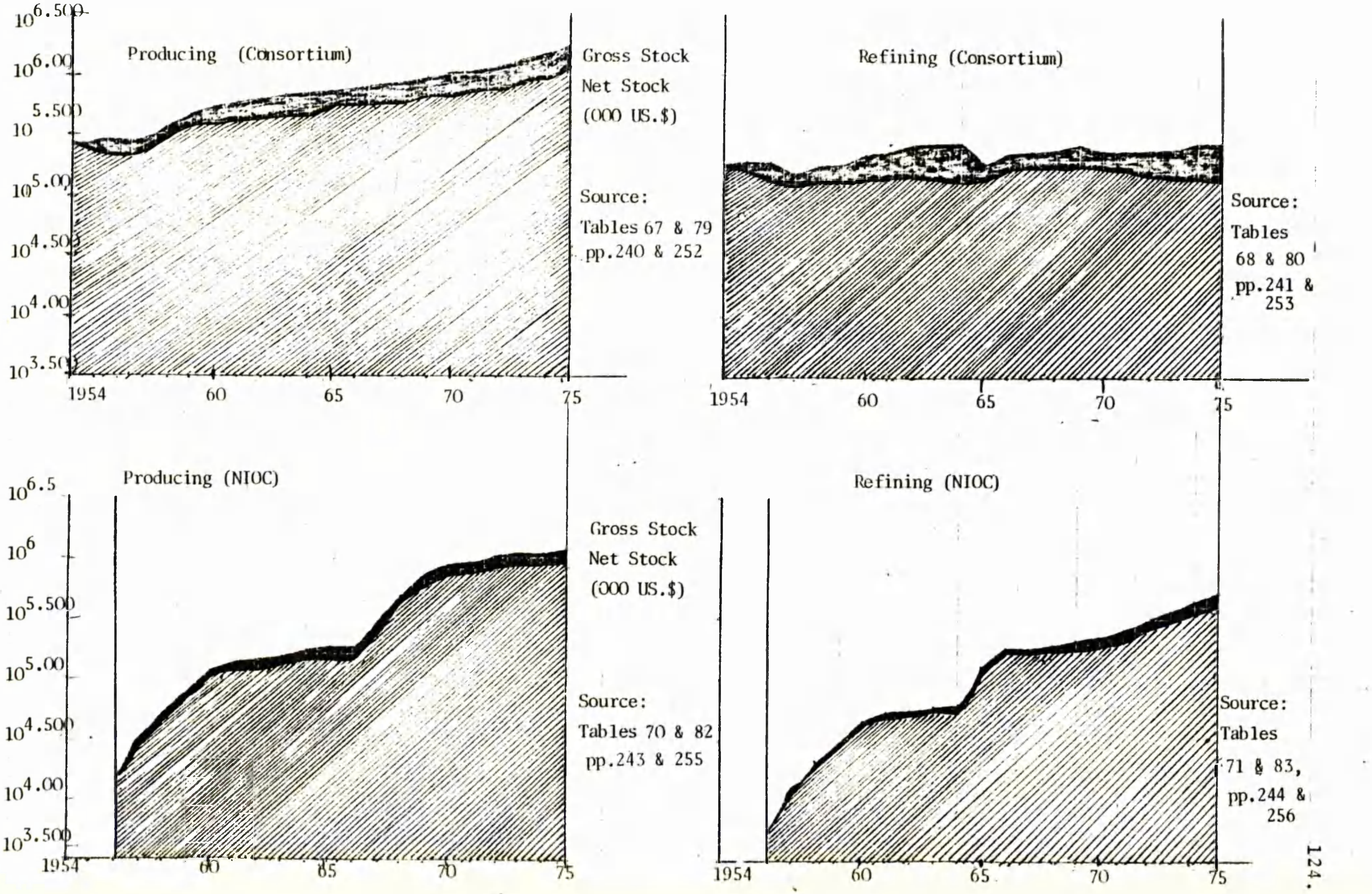
1. This of course depends on the rapidity with which the industry chose to inject modern technology in its capital structure.

sector of Consortium has enjoyed a moderate average rate of growth, while refining stocks of the Consortium have slightly shrunk. NIOC has registered high rates of growth in both sectors of the industry, although the growths in both sectors do not coincide in time.

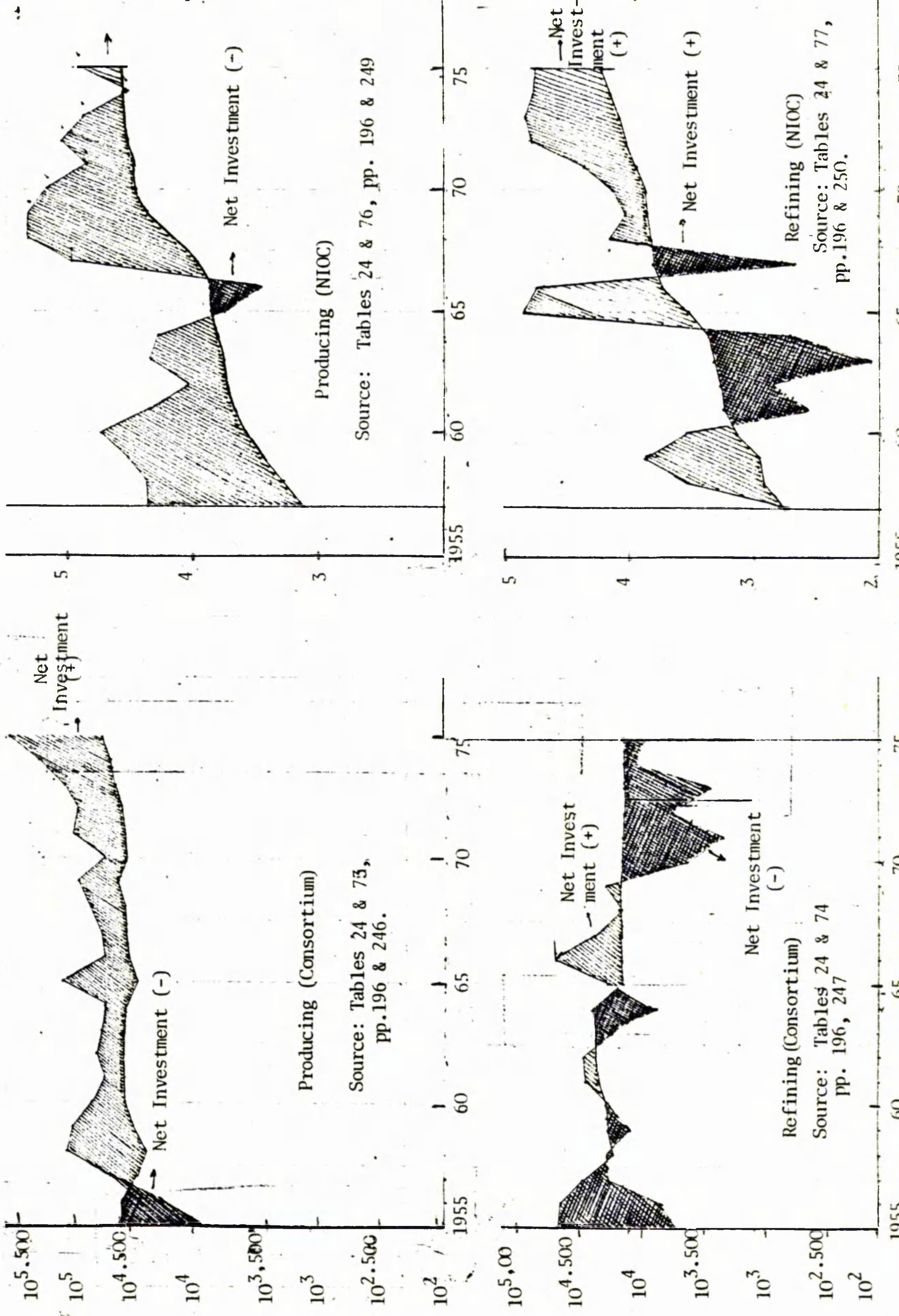
Tables 91 - 92 are the figures for depreciation and Fixed Assets Charges as calculated by the British Petroleum, and the same data using the procedure and sources of the Operating Companies calculated by the author (see also Sheet No. 6 for comparison). The difference between the series calculated by this study and those of the Consortium is due to differences in definitions of capital goods as well as methods of depreciation. But the difference between the two series calculated by BP and the author, both apparently on the basis of the data, definitions and rules of the industry is not explicable. However it is possible that the BP series are not correct since they do not tally with the data provided by the balance sheets of the Operating Companies.

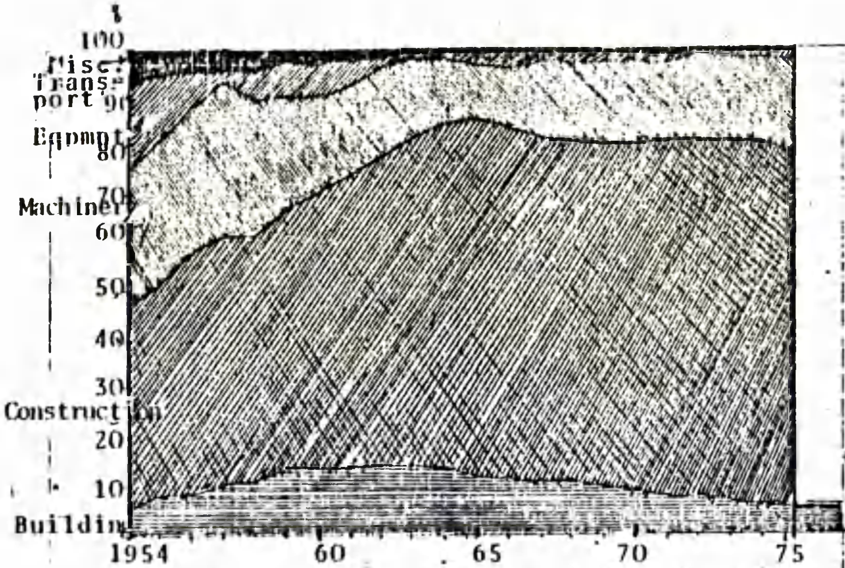
Furthermore, there is no consistent relationship between any of the depreciation series with those of the annual investment, and this finding is in line with the known fact that there is no direct cost-price relationship in the operation of the Middle East oil.

Finally, Table 93 speaks of net annual investment (also illustrated in Sheet No. 2, discussed above).

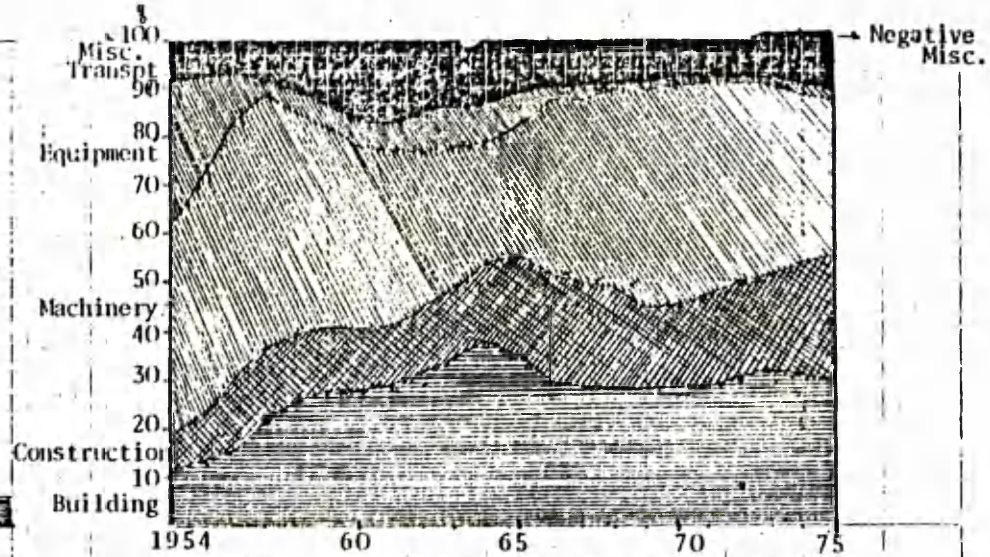

Producing (Consortium)
Gross Stock
Net Stock
(000 US.$)
Source:
Tables 67 & 79
pp.240 & 252
Refining (Consortium)
Source:
Tables
68 & 80
pp.241 & 253
Producing (NIOC)
Gross Stock
Net Stock
(000 US.$)
Source:
Tables 70 & 82
pp.243 & 255
Refining (NIOC)
Source:
Tables
71 & 83,
pp.244 & 256
$10^{6.500}$
$10^{6.00}$
$10^{5.500}$
$10^{5.00}$
$10^{4.500}$
$10^{4.00}$
$10^{3.500}$
$10^{6.5}$
10^{6}
1954
60
65
70
75

ANNUAL INVESTMENT (000 US.$ 1969 Constants)
Annual Depreciation (000 US.$. 1969 Constants) (Source: Table 77)

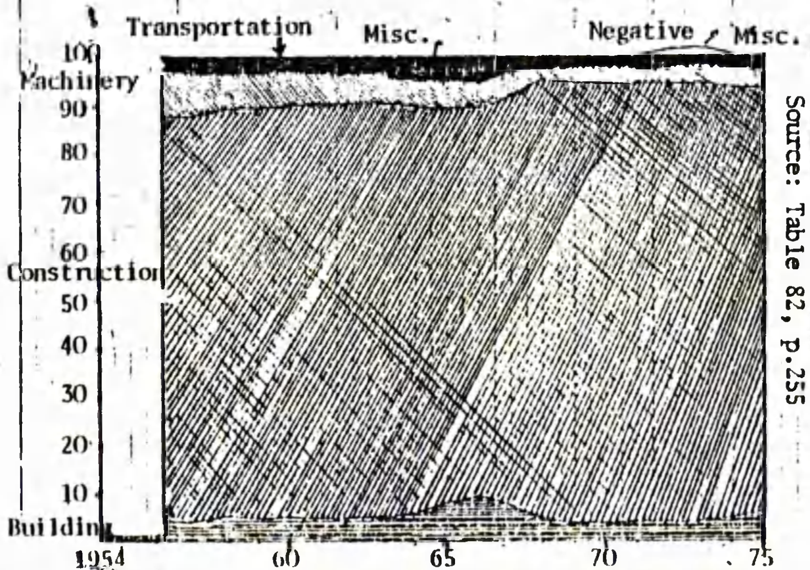




NET STOCK: Constituents as percentage of the whole
Producing (Consortium) Source: Table 79, p.252

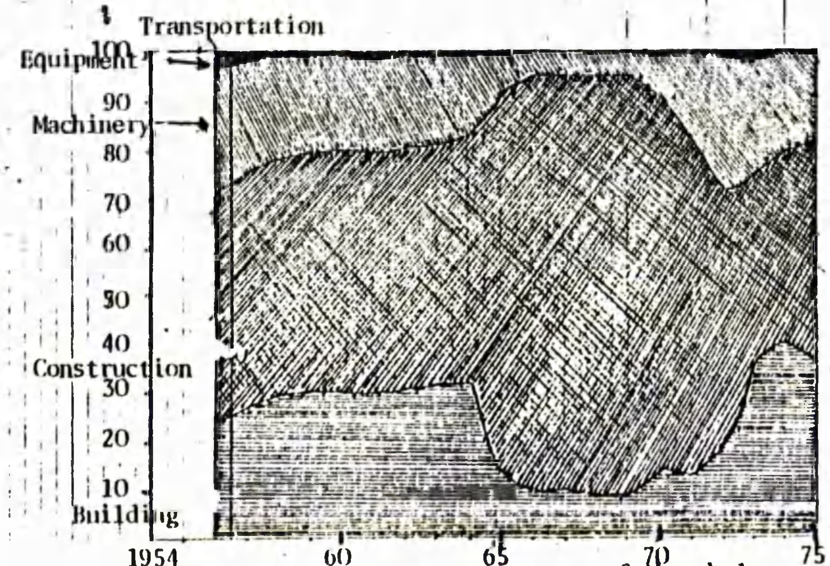


NET STOCK: Constituents as percentage of the whole
Refining (Consortium). Source: Table 80, p.253.



NET STOCK: Constituents as percentage of the whole
Production (NIOC)

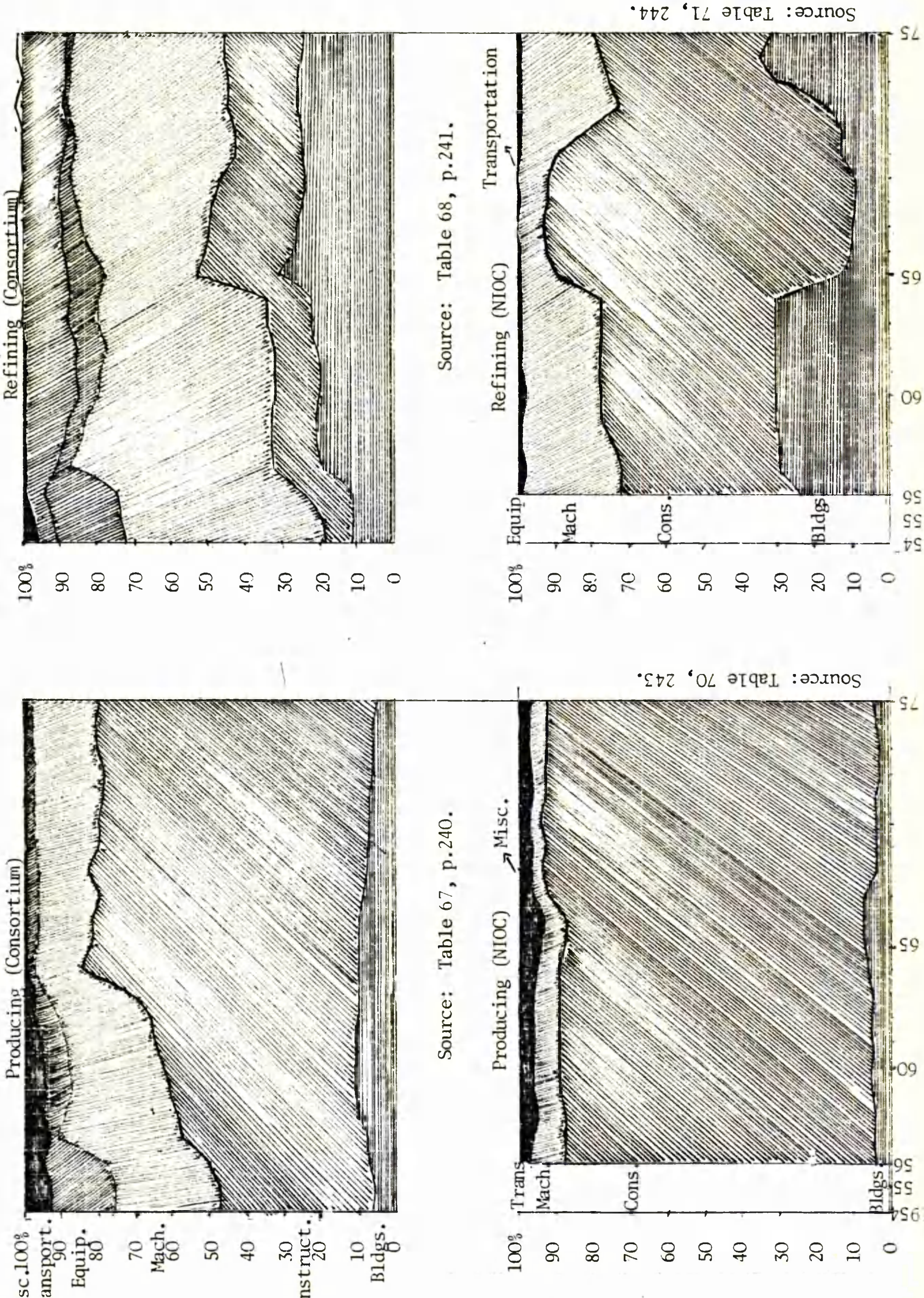
Source: Table 82, p.255



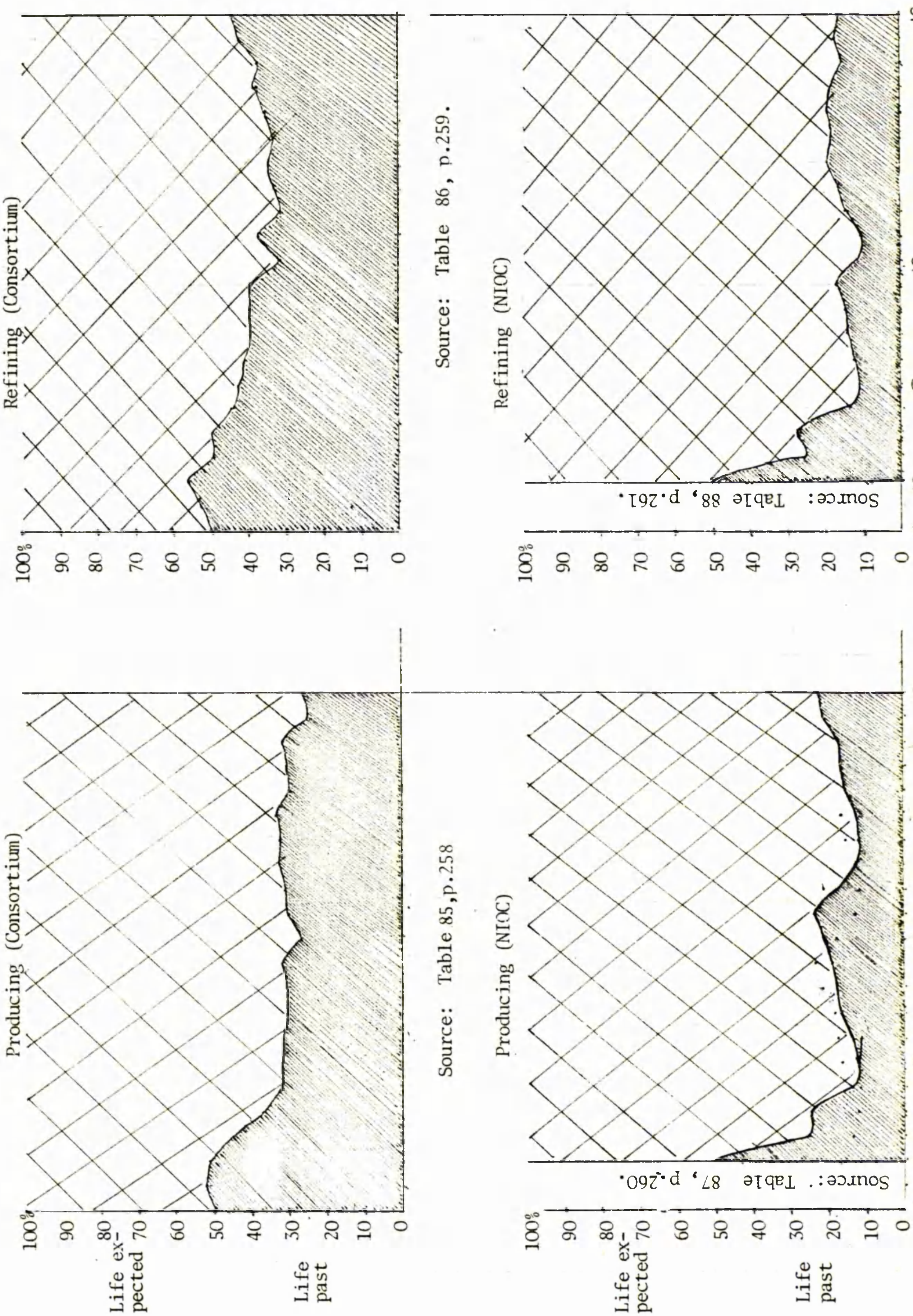
NET STOCK: Constituents as percentage of the whole
Refining (NIOC)

Source: Table 83, p.256

GROSS STOCK: CONSTITUENTS AS PERCENTAGE OF THE WHOLE

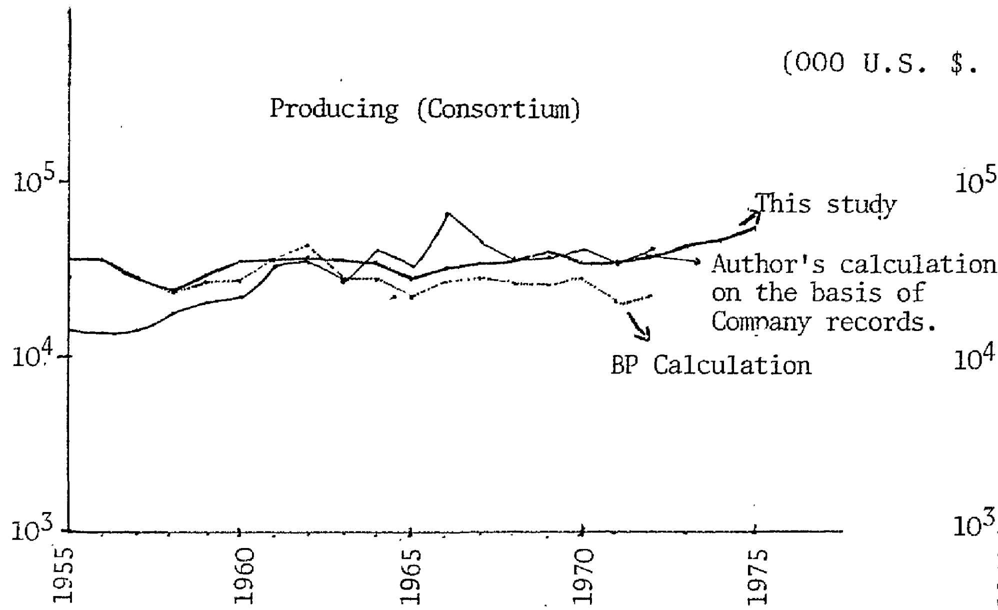


AGE COMPOSITION OF CONFLOMERATE CAPITAL STOCK (per cent)



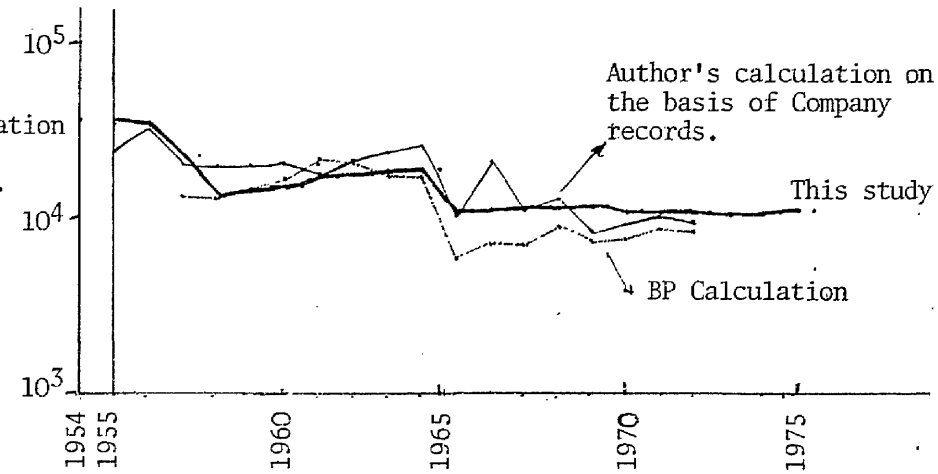
(000 U.S. \$. 1969 Constants)

Producing (Consortium)



Source: Tables 73, 91 & 92 , pp. 246, 264, 265.

Refining (Consortium)



Source: Tables 74, 91 & 92, pp. 247, 264 & 265.

DEPRECIATION (this study)

DEPRECIATION & FIXED ASSETS CHARGES (BP)

DEPRECIATION & FIXED ASSETS CHARGES (Author: Company Procedure)

CHAPTER VII

CAPITAL-LABOUR STRUCTURES AND PRODUCTIVITY GROWTH

VII.1. So far I have defined, classified, measured and processed the fixed capital, and delineated its structure and time-path in the oil industry in Iran. The purpose of this chapter is to analyse the correspondent trend of production factors in relation to one another and to try to explain the increased output-per-unit-of-input, which is not explained by availability of labour-per-unit-of-output and/or capital-per-unit-of-output. This, as in Solow's study,[1] would mean any kind of shift in the production function, to include slowdowns, speedups, improvements in the education of labour force and so forth.

The scope of this analysis is, however, restricted to include only the refining processes of Iranian Oil Consortium, leaving out all producing activities - of both Consortium and NIOC - and refining activities of NIOC, all of which have been the subject of research throughout chapters I - IV. Furthermore, Mah-Shahr NGL Refinery - a constituent of Consortium refining institutions - is also excluded. The reasons for this narrowing-down are two-fold: technical and practical. The former is that in order to be able to delineate factor productivity and

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1. Solow, M. Robert, 'Technical Change and the Aggregate Production Function', Review of Economics and Statistics, 1957, pp. 312-320.

'technology Index' one needs some 'reasonable' data about natural and engineering specifications of reservoirs and wells in order to differentiate the impact of given units of factor-inputs in variations of productivity. These being virtually non-existent precludes the analysis of production relations in the sector of crude production. Nevertheless, the procured and processed factor data as to factor inputs in this sector are given in the Appendix (10, below).[1] The latter is that Iranian non-consortium sector of refining, comprising a small, though growing, fragment of total refining in Iran, has, throughout the period under study, been developing rapidly. Therefore, both capital and labour inputs include development requirements as well and cannot be attributed to immediate output series. Moreover, the data available about the labour force engaged in NIOC sector of oil industry do not yield to any sound assumption as to proportion of manpower being engaged in refining, compared to that in production. Hence the exclusion of Iranian sector of refining.

VII.2.1. Output schedule is a function of operating capital and manpower structures, the relation between which is determined by their reciprocal 'technical embodiments' (Chart 1).

In order for output to be measurable, it must be homogeneous. Otherwise, a barrel of aviation turbine fuel plus a barrel of bitumen do not make two. The problem, therefore, is that of aggregating a basket of heterogeneous products. How would one, for example,

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1. pp. 263-273.

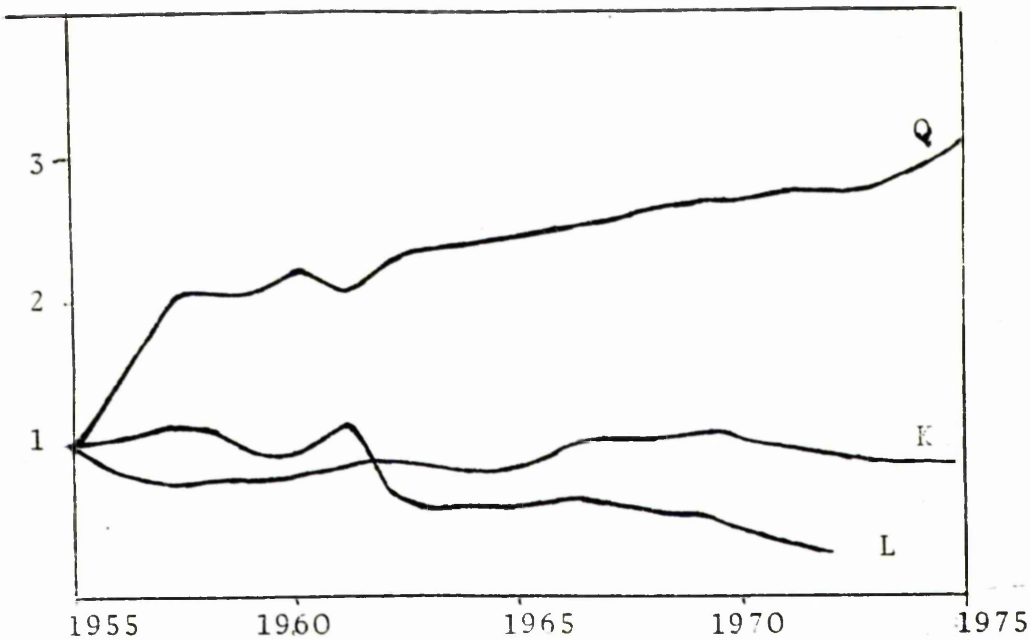

Chart 1. Indexes of Output (Q), Capital (K) and Labour (L) (1955 = 1.00).
(Q = Quantity, K = Capital, L = Labour).

determine the proper coefficient to make a barrel of Imshi equal to another of lubricating oil, or a certain quantity of propane to another quantity of vapourizing oil in physical terms? To specify the different uses of them is both impossible - because utilities of every product are functions of the structures of our needs and abilities at any given point in time - and undesirable, because utilities are incomparable qualities (Table 1 below).

In the case of highly complex composition of products as in an economy, the only possible and reasonable way of establishing comparability among otherwise different items is resorting to the concept of 'constant price', a substitute for a physical concept. In an empirical study, however, physical measurement would also be justified if one can safely assume that the proportion of ingredients

Table 1.

Abadan Gross Products (000) Bls/Year.

Items	1955	1956	1957	1968	1959	1960	1961	1962	1963	1964	1965
Propane/Butane	6	8	9	13	22	43	63	81	112	154	209
Aviation Spirit	391	2,697	4,349	4,481	4,532	4,924	4,250	5,077	4,970	5,035	6,359
Aviation Turbine Fuels	-	-	-	-	3,592	4,168	4,248	5,787	7,286	7,497	9,763
Motor Spirit	9,774	12,861	15,553	16,959	16,860	19,563	14,922	15,718	13,916	12,758	12,657
Cat. Reformer	(18)*	1,986	1,678	994	619	392	366	1,508	2,682	2,511	2,081
Naphtha	-	-	-	-	-	-	-	-	-	-	578
S.B.P. Spirit	6	597	677	767	686	793	757	1,258	1,251	1,380	1,167
IMSHI	7	6	4	5	5	5	5	4	5	5	6
Kerosene	7,971	11,661	15,128	15,500	14,987	15,190	13,559	15,203	13,918	16,075	13,447
Vaporizing Oil	1,608	2,077	2,786	2,921	1,882	2,100	1,876	2,006	1,647	1,838	1,318
Gas Oil	4,293	7,844	10,770	13,351	15,829	14,052	14,690	18,020	17,865	17,547	19,490
Diesel Oil	3,148	5,712	8,152	6,786	6,547	6,582	4,479	4,728	4,072	3,211	2,220
Fuel Oil	24,335	32,236	47,307	43,387	41,843	49,904	45,361	51,447	53,810	55,906	57,048
Lubricating Oil	77	78	107	113	106	123	133	135	178	247	313
Bitumen	443	1,348	1,250	1,267	1,611	1,615	1,813	1,424	1,078	1,227	1,105
Total	52,041	79,111	107,770	106,545	109,121	119,458	105,624	122,396	122,790	125,393	127,760
Less: Recovered from BMS Debellashing facilities	-	-	-	-	-	-	-	-	-	-	-
Grand Total	52,041	79,111	107,770	106,545	109,121	119,458	105,624	122,396	122,790	125,393	127,760

*White spirit (negative resulting from decanting to stops).

Totals may not add up due to rounding.

Source: Iranian Oil Services Ltd 'Reconciliation Reports', 1955 through 1975.

1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
302	447	535	488	597	833	917	1,235	1,328	1,390
6,502	6,477	6,533	6,476	5,752	5,361	5,478	5,217	4,908	4,123
10,564	10,343	12,617	13,291	12,743	10,776	13,429	13,157	12,541	12,520
12,251	11,526	11,983	11,803	12,798	14,497	14,123	15,003	14,400	15,201
3,517	3,175	3,748	2,408	1,267	947	1,371	1,505	1,136	822
706	1,912	2,313	4,934	4,438	2,718	3,492	3,026	5,877	8,485
985	1,106	1,146	1,034	954	872	999	770	623	689
6	5	4	4	4	3	4	4	4	4
12,834	13,444	14,180	14,976	14,196	16,588	14,763	14,546	13,618	15,115
1,782	1,662	1,810	1,517	1,300	813	654	465	268	224
21,057	21,100	22,853	22,719	24,184	26,126	24,363	25,891	26,762	25,685
1,975	1,797	1,886	1,580	1,545	1,539	2,030	1,922	1,477	1,739
57,578	60,521	57,253	59,818	62,544	62,334	62,017	63,928	69,897	69,610
370	327	360	354	395	468	558	788	464	646
1,398	1,965	1,698	1,830	1,658	2,012	1,667	2,222	2,629	2,753
131,827	135,807	138,921	143,231	144,376	145,888	145,863	149,677	155,934	159,005
-	-	-	-	-	-	(35)	(127)	(121)	(128,560)
131,827	135,807	138,921	143,231	144,376	145,888	145,828	149,549	155,813	158,877

in the whole composite stays 'reasonably' stable.

Nevertheless, with a closer inspection of the output data one tends to think that it would be ideal to acquire the constant price series for each item of products to allow room for the observed change of composition. But short of achieving the ideal, one has to be content with the assumption of 'reasonable' constancy of composition, and thence resort to physical measurement of the aggregate products, as in Table 2 and Chart 2.

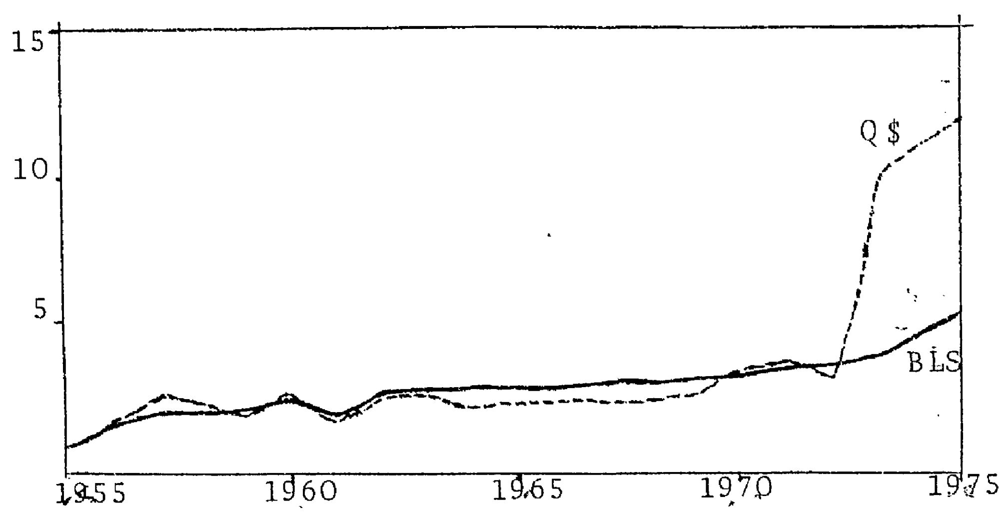

Chart 2. Indexes of Quantity (BLS) and Value of aggregate refined products (Q$). (1955 = 1)

VII.2.2. The definition, classification, measurement, deflation and depreciation of capital has been the subject of Chapters III through VI. Capital goods are aggregated through the concept of 'constant price' which is designed

Table 2.
Refined Products

Year	Refinery Products (000) Bl/Year	Price per Barrel $ (1)	Products Quantity Index	Products Value Index	ΔQ (000) Bls
1955	52,041	3.22	1.000	1.000	-
1956	79,111	3.22	1.520	1.524	27,070
1957	107,770	3.46	2.071	2.262	28,659
1958	106,545	3.46	2.052	2.214	-1,225
1959	109,121	3.12	2.097	2.048	2,576
1960	119,458	3.20	2.295	2.310	10,337
1961	105,624	3.14	2.030	2.000	-13,834
1962	122,396	3.14	2.352	2.310	16,772
1963	122,790	3.13	2.359	2.310	394
1964	125,393	2.89	2.410	2.190	2,603
1965	127,760	2.90	2.455	2.238	2,367
1966	131,827	2.86	2.533	2.262	4,067
1967	135,807	2.76	2.610	2.262	3,980
1968	138,921	2.76	2.669	2.310	3,114
1969	143,231	2.76	2.752	2.381	5,000
1970	144,376	3.17	2.774	2.762	1,145
1971	145,888	4.36	2.803	2.952	1,512
1972	145,828	4.23	2.802	3.714	-60
1973	149,549	11.44	2.874	10.310	3,721
1974	155,813	13.08	2.994	12.286	6,264
1975	158,877	14.13	3.053	13.524	3,064

1. See Appendix 11, p. 274 below.

to eliminate price variations due to changing market forces among the categories, and assumes constant structure of markets for items comprising a category. This concept, by assumption, rules out quality changes reflected in the prices. Thus the assumption of homogeneity of goods underlying the index of constant prices is modified to mean not identical goods - which would rule out variations of technical embodiments - but rather substitute goods commanding equal price of constant purchase power.

There is another scruple in the literature concerning the concept of 'real' capital, which conceivably may lie somewhere between the gross and net stock: the decline of net stock exceeds that of the ability of a capital good to contribute to production. This is implied by the definition of the net stock which covers the discounted value of the future services of capital goods, since the change in the net value of each capital good reflects the decline in remaining service life as well as deterioration of current services. On the other hand, the assumption of 'no decline in serviceability throughout life-time' underlying gross concept is extreme. Since with ageing of capital goods, maintenance and repair costs increase, and/or performance deteriorates. Moreover, new capital is more likely to be employed where it is more advantageous.[1] Nevertheless since there are no reasonable

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1. See Denison, E., Why Growth Rates Differ, Brooking Institute, 1967, pp. 140-1. Also, Nevin, E., 'The Life of Capital Assets; An Empirical Approach', Oxford Economic Papers, No. 3, Nov. 1963, p. 228.

criteria to determine what the 'real' capital might be, the net value concept is used in the analysis throughout (Table and Chart 3).

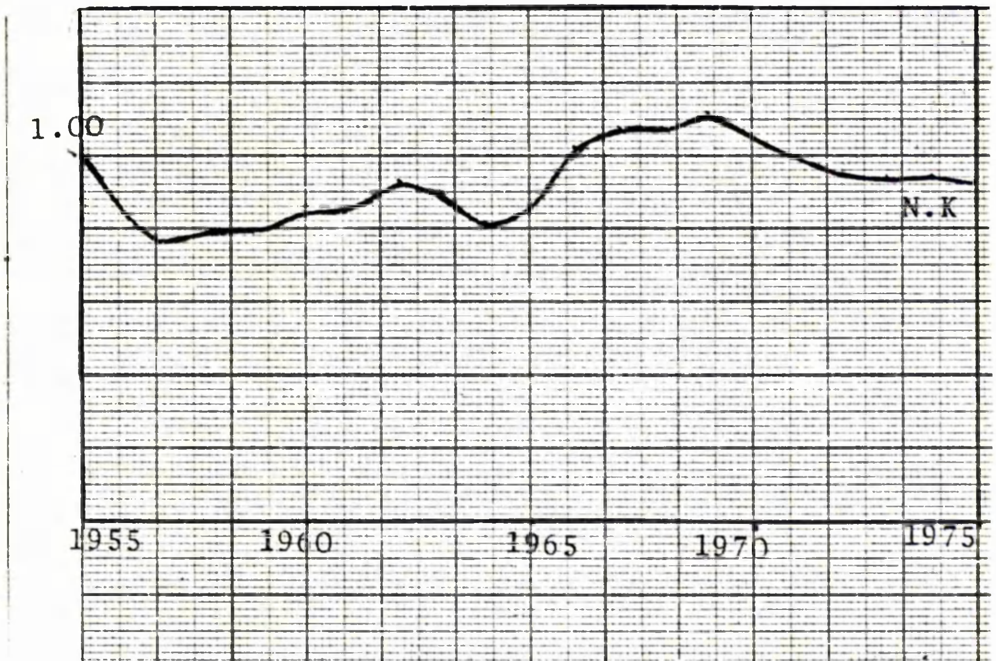

Chart 3. Net Capital Index. (1955 = 1.00)

Another concept which is complementary to that of fixed capital is the concept of 'operating costs' which includes costs of capital services (depreciation), wages, salaries, materials and other expenditure. These series are also classified in constant prices. For deflation, use has been made of four deflator series for Wages and Salaries, General Capital, Fuel and Products (Appendix 12,p.275 and Charts 4 and 5). See also Tables 4 and 5.

VII.2.3. Classical economy has consistently resorted to the concept of simple, homogeneous, abstract social labour. Indeed, concrete labour is as heterogeneous as uses of products are. However, some neoclassicals have attempted

Table 3.
Refining Capital

Year	Net Capital (000) 1969 $	Net Capital Index	Capital Consumption (000) 1969 $	Capital Consumption Index	Operating Costs (000) 1969 $	Operating Costs Index	ΔK (000) $
1955	158,486	1.000	38,086	1.000	86,372	1.000	-
1956	128,595	0.811	35,930	0.943	96,896	1.122	-29891
1957	122,574	0.767	23,518	0.618	109,357	1.129	-6021
1958	127,814	0.800	13,680	0.360	108,126	1.152	5240
1959	126,954	0.800	14,743	0.389	102,767	1.190	-860
1960	133,230	0.844	15,788	0.414	110,451	1.279	6276
1961	141,350	0.889	17,150	0.449	128,187	1.484	8120
1962	147,780	0.933	18,530	0.487	124,992	1.447	6430
1963	143,386	0.900	19,474	0.513	142,294	1.647	-4394
1964	130,143	0.822	19,840	0.522	113,324	1.312	-13243
1965	135,666	0.856	10,744	0.283	98,570	1.141	5523
1966	163,947	1.033	11,256	0.296	90,540	1.048	28281
1967	173,066	1.089	11,762	0.309	98,858	1.145	9119
1968	173,354	1.089	11,830	0.312	79,877	0.925	288
1969	176,414	1.111	12,122	0.318	75,879	0.879	3060
1970	167,934	1.056	11,243	0.296	76,002	0.880	-8480
1971	158,693	1.000	11,075	0.290	79,816	0.924	-9241
1972	152,031	0.956	10,783	0.383	80,000	0.926	-6662
1973	144,331	0.911	10,595	0.277	81,393	0.942	-7700
1974	146,292	0.922	10,821	0.283	75,083	0.869	1961
1975	145,478	0.911	11,120	0.293	75,869	0.878	-814

Source: Based upon data in Chapter VI and Annual Operating Reports of IOEPC and IORC 1955 - 1973.

Table 4.

Refining Operating Costs (000) U.S. Current Dollars

Items	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
1. Salaries	11,035	14,423	19,407	18,292	17,741	21,554	28,224	15,501	14,151	14,588	14,983
2. Wages	19,620	21,706	21,554	21,227	20,308	19,900	24,797	13,126	11,472	13,236	12,704
3. Contract payments	672	857	1,683	3,380	3,816	4,410	7,185	4,696	3,396	4,004	3,382
4. Materials	7,288	10,847	11,228	16,845	18,024	18,665	13,793	9,800	8,509	8,610	7,913
5. Fuel	-	-	-	-	-	-	-	-	-	-	-
6. Iranian Oil Services charges	-	-	949	1,047	946	1,078	1,226	1,190	1,134	1,067	972
7. Tehran, Head Office charges	-	-	1,960	2,951	3,976	4,435	-	4,382	3,951	3,805	3,959
8. Sundries	1,319	1,812	3,301	8,092	9,470	10,088	17,172	3,478	3,394	1,221	2,646
9. Depreciation	739	1,338	1,621	955	988	1,114	1,711	1,781	1,635	1,462	1,327
10. Fixed Assets charges	11,855	11,864	11,864	11,911	12,141	12,365	14,588	13,157	11,651	11,880**	3,206**
11. Non-basic assets charges	-	8	188	596	1,282	1,529	-	-	-	-	-
12. Chemicals	1,574	3,226	4,318	4,362	5,006	5,107	7,406	7,868	6,972	6,737	8,784
13. Agha-Jari Gas	-	-	-	-	-	557	515	700	846	918	700
14. Compensation & Gratuities	-	-	-	-	-	37	311	9,010	2,993	1,840	1,610
15. NIOC	-	-	-	-	-	1,042	1,669	24,125	28,204	29,618	24,797
16. Field gas	-	-	-	-	-	325	420	-	-	-	-
17. Company-made products	-	-	-	-	-	-	-	-	-	-	-
18. Auxiliaries	-	-	-	-	-	-	-	-	-	-	-
19. Service Expenditure	-	-	-	-	-	-	1,596	-	-	2,764	2,416
20. Charges from other centres	-	-	-	-	-	-	-	460	1,198	280	148
21. Tetra-Ethyl lead	1,490	2,772	3,870	4,276	4,374	4,623	-	-	-	-	-
22. Commissary supplies	-	-	-	-	-	-	5,200	-	-	-	-
23. Less: Recoveries & Expenditures capitalized	6,373	5,816	7,258	19,264	20,938	20,222	22,042	11,850	10,562	11,004	8,994
24. Total	49,216	61,816	74,679	74,673	77,132	86,601	103,771	98,678	89,474	90,745	80,553
25. Operating Profits	1,537	2,293	3,116	3,074	3,164	3,430	2,904	3,360	3,371	3,405	0

Note: Due to changing definitions and inconsistent practice of accounting some of the items do not mean one and the same category throughout the period.

1966	1967	1968	1969	1970	1971	1972	1/1/73 20/3/73 1973	21/3/73 31/12/73 1973	1974	1975
15,431	14,785	13,786	13,747	11,486	10,847	11,505	2,892	32,906	40,301	49,903
12,914	12,436	11,798	11,904	10,709	9,645	10,312	2,479			
7,468	5,254	3,715	4,114	2,558	2,326	3,655	1,169			
7,750	7,727	6,814	8,035	8,846	9,558	10,210	3,968	35,359	34,500	57,895
-	-	-	-	-	-	-	-			
1,126	1,058	991	1,183	1,289	1,306	-	459			
4,547	4,433	4,486	4,865	8,004	10,095	10,000	2,046	7,256	1,793	2,233
2,632	2,379	1,846	2,105	2,671	3,627	3,622	(984)	852	3,201	5,629
1,268	1,002	665	667	598	588	605	119	6,402	5,463	5,832
4,782	5,062	7,726	7,003	7,699	9,500	9,730	1,570			
	-	-	-	-	-	-	-	30,724	37,183	46,853
8,215	6,850	6,845	7,714	7,997	10,100	12,402	3,123			
991	589	4,591	5,362	4,414	5,227	-	-			
2,254	6,161	25,051	25,922	25,260	25,450	5,742	1,827			
24,956	28,504	485	655	595	701	-	7,970	6,304	4,370	7,661
-	-	-	-	-	-	850	163	1,087	3,734	3,666
-	-	-	-	-	-	-	-			
-	-	-	-	-	-	6,637	-			
3,466	3,421	1,133	886	1,853	5,555	-	1,067	1,600	1,555	2,125
174	81	286	252	170	345	-	61	3,689	4,901	6,600
						n.a.				
11,850	13,219	13,862	18,535	16,186	16,812	21,357	5,642	24,000	29,655	44,979
85,005	86,945	76,421	75,533	77,964	88,059	91,902	22,290	102,181	107,346	143,418
-	-	-	-	-	-	-	-	-	-	-

1972 Bandar Mah-Shahr NGL Refinery is not included.

Table 5.
Refining Operating Costs (000) U.S. 1969 Constant Dollars

	Items	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
x	1. Salaries	17,885	21,495	27,685	25,836	22,176	24,976	32,182	17,515	15,829	15,636
x	2. Wages	31,799	32,349	30,747	29,982	25,385	23,059	28,275	14,832	12,832	14,186
-	3. Contract payments	1,328	1,371	2,377	5,030	5,390	6,142	9,709	6,540	4,614	5,396
-	4. Materials	14,403	17,355	17,012	25,067	25,458	25,996	18,639	13,649	11,561	11,604
*	5. Fuel	-	-	-	-	-	-	-	-	-	-
-	6. Iranian Oil Services Charges	-	-	1,438	1,558	1,336	1,501	1,657	1,657	1,541	1,438
-	7. Tehran, Head Office charges	-	-	2,970	4,391	5,616	6,177	-	6,103	5,368	5,128
o	8. Sundries	2,607	2,899	5,002	12,042	13,376	14,050	23,205	4,844	4,611	1,646
-	9. Depreciation	1,460	2,141	2,456	1,421	1,395	1,552	2,312	2,481	2,221	1,970
-	10. Fixed Assets Charges	23,429	18,982	17,976	17,725	17,148	17,221	19,714	17,876	15,830	16,011
-	11. Non-basic Assets Charges	-	13	285	887	1,811	2,130	-	-	-	-
-	12. Chemicals	3,111	5,162	6,542	6,491	7,071	7,113	10,008	10,958	9,473	9,080
*	13. Agha-Jari Gas	-	-	-	-	-	473	449	619	766	832
x	14. Compensation & Gratuities	-	-	-	-	-	42	355	10,181	3,348	1,972
-	15. NIOC	-	-	-	-	-	1,451	2,255	33,600	38,321	39,916
*	16. Field Gas	-	-	-	-	-	276	366	-	-	-
*	17. Company-made Products	-	-	-	-	-	-	-	-	-	-
o	18. Auxiliaries	-	-	-	-	-	-	-	-	-	-
x	19. Service expenditure	-	-	-	-	-	-	1,820	-	-	2,962
-	20. Charges from other centres	-	-	-	-	-	-	-	641	1,628	377
-	21. Tetra-Ethyl Lead	2,945	4,435	5,864	6,363	6,178	6,439	-	-	-	-
-	22. Commissary Supplies	-	-	-	-	-		7,027	-	-	-
-	23. Less Recoveries & Exp. Cap.	12,595	9,306	10,997	28,667	29,573	28,164	29,786	16,504	14,351	14,830
	24. Total	86,372	96,896	109,357	108,126	102,767	110,451	128,187	124,992	142,294	113,324
-	25. Operating Profits	3,038	3,669	4,721	4,574	4,469	4,777	3,924	4,680	4,580	4,589

- Capital Index
x Wage Index
* Fuel Index
o Miscellaneous Index

1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
16,025	16,364	15,547	14,271	13,747	11,316	10,128	10,110	30,119	37,242	30,040
13,587	13,695	13,077	12,213	11,904	10,551	9,457	9,062			
4,497	9,289	6,376	4,096	4,114	2,427	2,035	3,000			
10,523	9,639	9,377	7,513	8,035	8,393	8,362	8,383	26,826	20,211	39,035
-	-	-	-	-	-	-	-			
1,293	1,400	1,284	1,093	1,183	1,223	1,143	-	313	-	-
5,265	5,655	5,380	4,946	4,865	7,594	8,832	-	1,396	1,050	1,120
3,519	3,274	2,887	2,035	2,105	2,534	3,173	2,974	(90)	1,875	2,823
1,765	1,577	1,216	733	667	567	514	497	4,448	3,200	2,925
4,263	5,948	6,143	8,518	7,003	7,305	8,311	7,989	1,071	-	-
-	-	-	-	-	-	-	-	20,958	21,783	23,497
11,681	10,218	8,313	7,547	7,714	7,567	8,836	10,188	-	-	-
634	898	535	4,239	5,362	4,423	3,869	-	-	-	-
1,722	2,390	6,478	25,933	25,922	24,887	23,763	5,046	1,444	-	-
32,975	31,040	34,592	535	655	565	613	-	9,737	2,560	3,842
-	-	-	-	-	-	-	570	725	582	514
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	4,332	-	-	-
2,584	3,676	3,597	1,173	886	1,826	5,187	-	2,108	1,082	1,320
197	216	98	315	252	161	302	-	2,558	2,871	3,310
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	n.a.	-	-	-
11,960	14,739	16,042	15,282	18,535	15,357	14,709	17,534	20,220	17,373	22,557
98,570	90,540	98,858	79,877	75,879	76,002	79,816	80,000	81,393	75,083	75,869
-	-	-	-	-	-	-	-	-	-	-

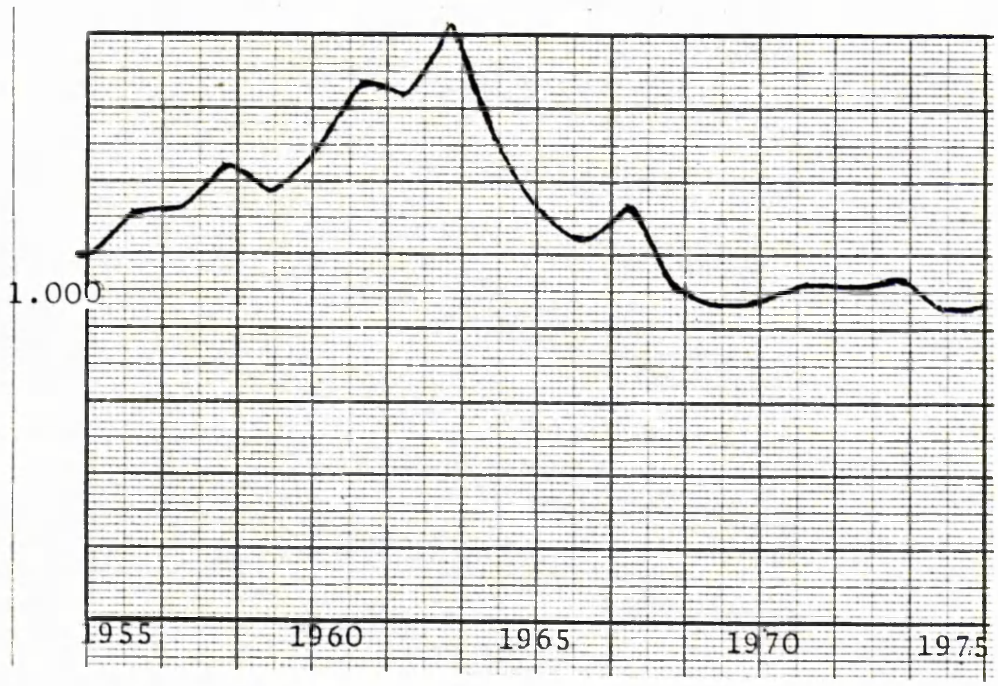

Chart 4. Operating Costs Index. (1955 = 1.00)

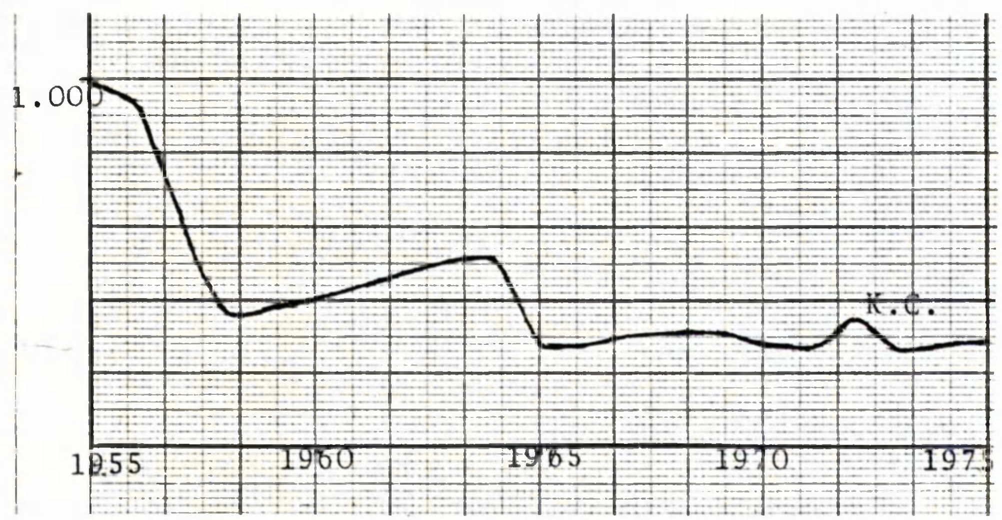

Chart 5. Capital Consumption Index. (1955 = 1.000)

to elaborate plausible coefficients in order to aggregate concrete varieties of labour. The attempt can simply be illustrated as trying to find some means of equating an hour of, for example, a mananager's labour with that of a mechanic, or that of a computer-engineer with that of a marine operator, and so on and so forth.

Indeed, there are as many qualities of labour as there are jobs (processes) or, for that matter, individual labourers. This nonetheless is the case in any single sector as the one under study.

The quality of labour is affected by a variety of factors such as age, education, experience, occupation, organization, sex, duration, and elements as subjective as mood. Therefore, assuming a single process of production with a constant intensity of labour (static state of technology), and a given quantity of some otherwise identical labour, output can be written as a function of, say for example, age. The quality of labour improves as men mature, though at certain point diminishing returns may set in due to ageing. However, parts of this decline in efficiency will be offset by gains in experience and knowledge. The same can be said of education, or for that matter, any of the factors contributing to labour.[1]

1. Niitamo made a regression model of production in Finland and found most of the increase was attributable to the passage of time and experience, and little was attributable to capital formation. He concluded that emphasis should be taken away from capital as an aid to economic growth and placed instead on these other factors which he lumped together as the human factor. See Niitamo, O., 'The Development of Productivity in Finnish Industry, 1925-52', Productivity Measurement Review, No. 15, Nov. 1958, pp. 30-41. Also, for a study of 'the trickling-down process of innovation through experiments' see Shen, T.Y., 'Innovation, Diffusion and Productivity Changes', Review, 1961, pp. 175-181, and for a study of combination of factors see Denison, E., 'Why Growth Rates Differ', op.cit., where he argues that 'reduced hours are wholly or partly offset by increased productivity per working-hour'. Also, Bowman, M.J., 'Principles in the Valuation of Human Capital', Review of Income and Wealth, 1968, p. 217.

But it would be a gross misconception to adhere to the physical concept of labour since there is no satisfactory way of quantifying the quality of labour (Table 6). Labour is already aggregated and measured through the labour-market, in terms of its price: a child's labour in _n_ hours equals a man's labour in n-h hours and they are paid _p_ dollars equally (age). A woman's labour in _n_ hours equals that of a man in n-h' hours and both equally receive _p_ dollars (sex). A man in position _o_ gains P dollars for n hours, while the same man in position _o'_ gains P + p dollars for equal hours (occupation). A man with a high-school training gains _p_ dollars in a given position, for _n_ hours, while the same man with a technician's training gains P + p dollars at the same job for equal number of hours (education). Someone with _2_ years of experience gains _p_ dollars in a given job for certain hours, while the same man, in the same position, and with equal number of hours gains P + p dollars if he possesses 10 years of experience (experience). And so on and so forth. Thus all factors are accounted for through market mechanism of the economy in such a way that no other contrivance can reasonably substitute. The problem with this mechanism, however, is the implied assumption of equilibrium.

On this basis, I have taken _constant_ wages and salaries as indication of the quantity and quality of

Table 6

Refining Personnel

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Head Office[1]		35	145	181	218	260	354	424	420	380	355
Non-basics					2,565	4,139	8,995	8,090	7,743	7,478	
Management		24	37	31	21	27	31	37	33	-	
Process Operations		4,219	-	-	-	3,469	3,073	2,445	2,288	-	
Maintenance and Construction		13,140	-	-	-	5,820	4,896	-	-	-	
Transportation		2,880	-	-	-	-	-	-	-	-	
Marine Operations		1,394	-	-	-	-	-	-	-	-	
Planning and Develop.		596	608	514	480	392	380	-	-	-	
Administration		5,769	-	-	-	-	-	-	-	-	
Operation Division		-	22,178	20,310	16,481	-	-	-	-	-	
Personnel		-	3,044	2,498	1,752	1,711	155	117	-	105	
Accounts & Business		-	1,568	1,308	1,160	1,076	927	404	397	360	
General Services		-	-	-	-	5,183	4,418	1,320	-	-	
Office Printing & Services		-	-	-	-	-	-	450	411	-	
Safety & Guards		-	-	-	-	-	-	239	217	-	
Materials		-	-	-	-	-	-	527	469	-	
Mechanical		-	-	-	-	-	-	5,411	368	-	
Technical		-	-	-	-	-	-	392	5,453	379	
Others		-	-	-	-	-	-	-	857	850	
General Management		-	-	-	-	-	-	-	-	629	
Manufacturing		-	-	-	-	-	-	-	-	8,369	
Foreign Staff		-	-	258	304	310	252	188	133	94	
Total	29,604	28,057	27,580	25,100	22,981	22,387	23,481	20,044	18,898	18,644	17,820

	1966	1967	1968	1969	1970	1971	1972
Head Office[1]	430	420	436	508	424	460	420
Total	16,820	15,487	13,828	12,429	11,287	10,528	10,343

1. The proportion of salaries paid in each sector has served as criterion for allocating head office personnel.

2. The average ratio of producing 'non-basics' to refining 'non-basics' of 37/63 through 1968-72 is the assumed criterion for allocating 'non-basics' personnel to each sector.

Source: Operating Companies Annual Reports 1955-1973 & Iran Oil Journal, All available issues.

manpower rather than the physical number of employees,[1] the former having the advantage over the latter of reflecting changes in the composition of labour force. To illustrate, a comparison between the index of constant wages and index of constant 'wages and salaries' combined, shows a change in composition of total labour in favour of the 'salary-paid' as compared to the 'wage paid', see Table 7 and Charts 6, 7, 8 and 9, also appendices 13 and 14.[2]

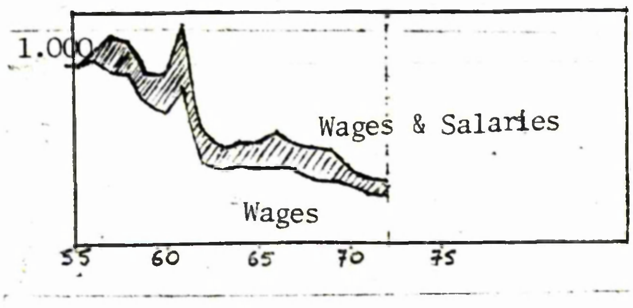

Chart 6. Index of Wages as Compared to Index of "Wages and Salaries" (1955 = 1.0)

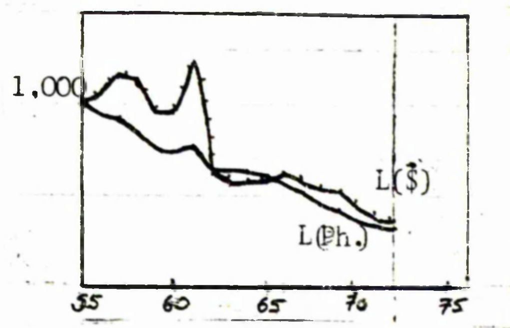

Chart 7. Labour Index in physical terms and value terms (1955 = 1.0)

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1. Both Solow and Massell adopt physical numbers and assume homogeneity of labour just the same. 'No attempt is made to allow for different grades of labour, for changes in the intensity with which the labour is applied, for changes in the composition of the labour force, nor for the increased importance of skills and education in more recent years. We have taken labour in terms of man-hours of same constant or average quality.' See Benton, F. Massell, 'Capital Formation and Technological Change in United States Manufacturing', Review, 1960, p. 183.

2. See Tachibanake, Toshiaki, 'Quality Change in Labour Input: Japanese Manufacturing', Review, 1976, p. 293, and Waldorf, William H.I., 'Quality of Labour in Manufacturing', Review, 1973, p. 284. Also Fair, Ray C., 'Labour Force Participation, Wage Rates and Money Illusion', Review, 1971, pp. 164-168 and Harris, Davis, Hitch, Kerr and Fabricant, 'Productivity and Wages', Review, 1949, p. 292, also Mitchell Edward J. 'Explaining the International Pattern of Labour Productivity and Wages: A Production Model with Two Labour Inputs', Review, 1968, pp. 461-469, and Brunet-Jailly, J. and Silvestre, J.J., 'A Production Model with Two Labour Inputs: A Comment, Review, 1971, pp. 288-289.

Table 7.

Labour

Year	Labour (Persons) (1)	Labour Physical Index (2)	Wages & Salaries (3) (000) 1969 US$	Wages & Salaries Index (4)	Wages (5) (000)1969 US$	Wages Index (6)	ΔL (000) $ (7)	Labour Composition Index (4) : (6)
1955	29,604	1.000	49,684	1.000	31,799	1.000	-	1.000
1956	28,057	0.948	53,844	1.082	32,349	1.019	4160	1.062
1957	27,580	0.932	58,432	1.175	30,747	0.966	4588	1.216
1958	25,100	0.848	55,818	1.124	29,982	0.944	-2614	1.191
1959	22,981	0.776	47,561	0.954	25,385	0.798	-8257	1.195
1960	22,387	0.756	48,035	0.964	23,059	0.727	474	1.326
1961	23,481	0.793	60,457	1.216	28,275	0.891	12422	1.365
1962	20,044	0.677	32,347	0.649	14,832	0.479	-28110	1.355
1963	18,898	0.638	28,661	0.577	12,832	0.404	-3686	1.428
1964	18,644	0.630	29,822	0.598	14,186	0.446	1161	1.341
1965	17,820	0.602	29,612	0.593	13,587	0.427	-210	1.389
1966	16,820	0.568	30,390	0.608	13,695	0.431	778	1.411
1967	15,487	0.523	28,624	0.577	13,077	0.412	1786	1.400
1968	13,828	0.467	26,484	0.531	12,213	0.386	-2140	1.373
1969	12,429	0.420	25,651	0.515	11,904	0.375	-833	1.373
1970	11,287	0.381	21,867	0.438	10,551	0.333	-3784	1.315
1971	10,528	0.356	19,587	0.392	9,457	0.296	-2282	1.324
1972	10,343	0.349	19,162	0.387	9,062	0.285	-423	1.358

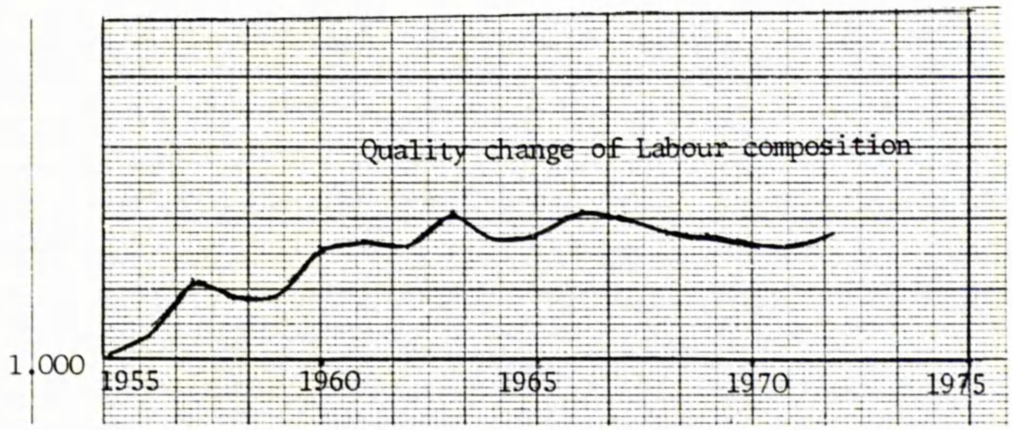


Chart 8. Labour Composition Change Index (1955 = 1.000)

VII.3.1. Factor ratios. Having aggregated output, capital and labour, and having defined technology as a combined factor determining the mutual structure of capital and labour, which would by definition lump together any change in the quality of either capital or labour, variations in return to scale or improvements in management or external factors, we are now in a position to analyse the relative variations of inputs vis-a-vis output. In order to record the change, I have arbitrarily set the first year under study as unity in the indexes of factor input and output.

Output per unit of labour (man-years) shows a growth of almost seven times as compared to output per unit of capital, of almost three times.

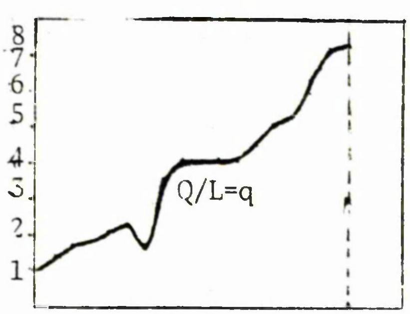


Chart 9. Index of Output/Labour (1955 = 1.000)

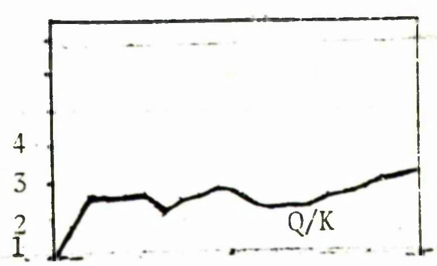


Chart 10. Index of Output/Capital (1955 = 1.000)

In the meantime the output per unit of capital services has grown almost ten times which as compared to that of output per capital, indicates a change in durability of capital. In other words, this indicates that the composition of capital has changed in favour of the longer lived ingredients such as construction and machinery as contrasted to shorter-lived items as equipment (Chart 11). Also, output per unit of operating costs has grown in the region of three and half times as compared to 3.3 times of output per unit of capital growth, implying a more or less constant relation between the stock of capital and other intermediary expenditures as compared to a declining share of capital consumption, see Table 8 and Charts 12 and 13.

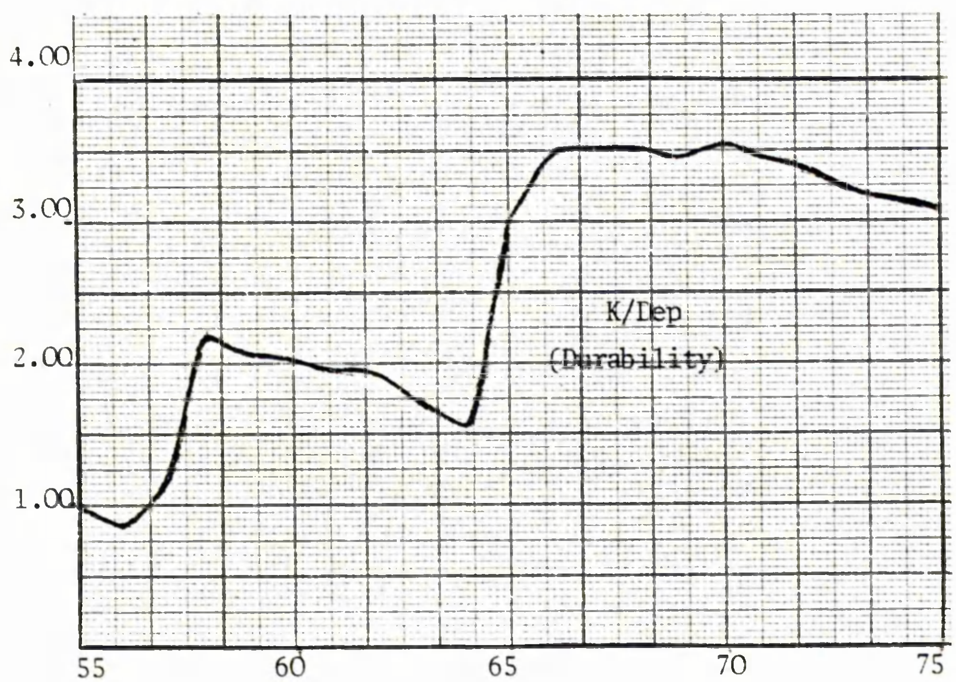
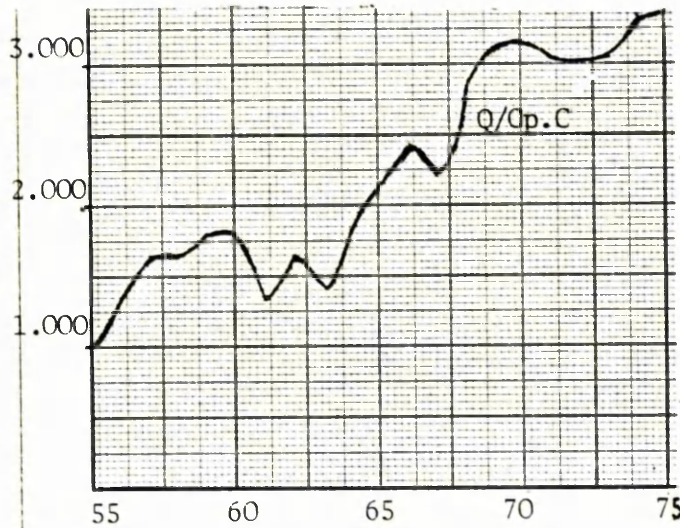


Chart 11. Capital Durability Index (1955 = 1.000)



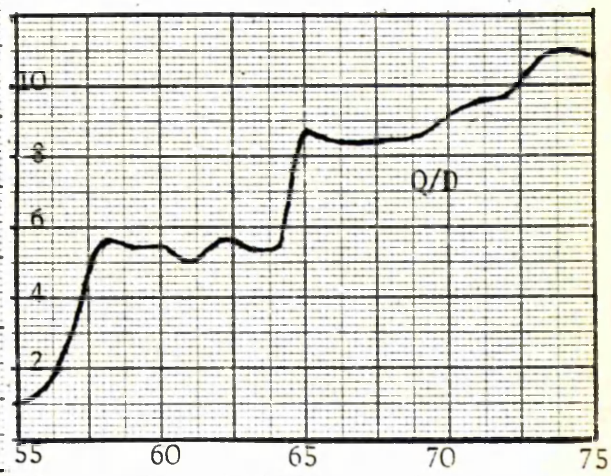


Chart 12. Output/Operating Costs Index (1955 = 1.000)

Chart 13. Output/Depreciation Index (1955 = 1.000)

VIII.3.2. Capital. An almost constant bulk of net capital in the face of a nearly trebled output means that capital has gone through deep processes of restructuring, hence a considerable substitution of capital for labour and capital for capital,[1] (Chart 14). During the period, capital

1. See Boddy, Raford and Gort, Michael, 'The Substitution of Capital for Capital', Review, 1971, pp. 197-88, also Brown, Murray, 'A Measure of Change in Relative Exploitation of Capital and Labour', Review, 1966, p. 182, also Eisner, Robert, 'Components of Capital Expenditure: Replacement and Modernization Versus Expansion', Review, 1972, pp. 297-305 and Griliches, Zvi, 'Capital-Skill Complementarity', Review, 1969, pp. 465-8, also Bowman, Raymond T. and Phillips, A., 'Conceptual and Statistical Problems in Estimating Capital Coefficients for Four Metal Fabricating Industries, The Problems of Capital Formation', NBER, Vol. 19, 1957, pp. 347-74 and see also Hodges, John E., 'A Report on the Calculation of Capital Coefficients for the Petroleum Industry', NBER (ibid.), pp. 375-388.

Table 8.

Output to Factors Ratios

Year	Q/L = q B1-year/ $ year	Q/L = q Index	Q/K = K B1/$	Q/K = K Index	Q/Depreciation B1/$ year	Q/D Index	Q/Operation Costs B1/$ year	Q/Op. Cost Index	Δq
1955	1.047	1.000	0.33	1.000	1.37	1.000	0.60	1.000	-
1956	1.469	1.403	0.62	1.879	2.20	1.606	0.82	1.367	0.422
1957	1.844	1.761	0.88	2.667	4.58	3.343	0.99	1.650	0.375
1958	1.909	1.823	0.83	2.515	7.79	5.686	0.99	1.650	0.065
1959	2.294	2.191	0.86	2.606	7.40	5.401	1.06	1.767	0.385
1960	2.487	2.375	0.90	2.727	7.57	5.526	1.08	1.800	0.193
1961	1.747	1.669	0.75	2.273	6.16	4.500	0.82	1.367	0.740
1962	3.784	3.614	0.83	2.515	6.61	4.825	0.98	1.633	2.037
1963	4.284	4.092	0.86	2.606	6.31	4.606	0.86	1.433	0.500
1964	4.205	4.016	0.96	2.909	6.32	4.613	1.11	1.850	0.079
1965	4.314	4.120	0.94	2.848	11.89	8.679	1.30	2.167	0.109
1966	4.338	4.143	0.80	2.424	11.71	8.547	1.46	2.433	0.024
1967	4.745	4.532	0.78	2.364	11.55	8.431	1.37	2.283	0.407
1968	5.245	5.010	0.80	2.424	11.74	8.569	1.74	2.900	0.500
1969	5.584	5.333	0.81	2.455	11.82	8.628	1.89	3.150	0.339
1970	6.602	6.306	0.86	2.606	12.84	9.372	1.90	3.167	1.018
1971	7.449	7.115	0.92	2.788	13.17	9.613	1.83	3.050	0.847
1972	7.610	7.268	0.96	2.909	13.52	9.869	1.82	3.033	0.161
1973	-	-	1.04	3.152	14.12	10.307	1.84	3.067	-
1974	-	-	1.07	3.242	14.40	10.511	2.08	3.467	-
1975	-	-	1.09	3.303	14.29	10.431	2.09	3.483	-

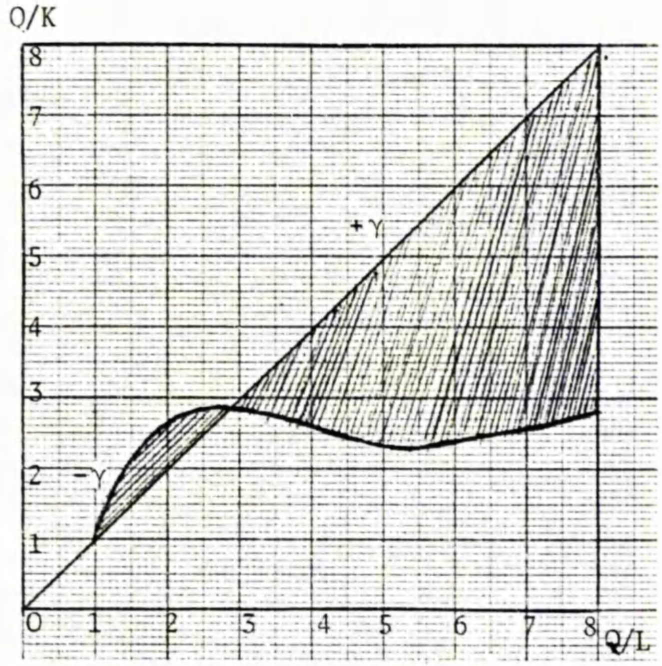


Chart 14. Substitution of Capital for Labour.

structures per unit of output declined from slightly more than three to slightly below unity. Although in this process of rapid re-structuring, the net stock slightly declined, nevertheless, accelerated attrition of the labour (to be seen below) accommodated for rapid technologization of capital and thus enhanced the ratio of capital per labour from about two and a half times. Another indicator also hints at this point: the four to one ratio of capital structures to capital consumption in 1955 grew to thirteen to one, an increase of above three times, which shows, as hinted above, a structural change in standing stocks of capital in favour of infra-structural projects. The decline in relative share of capital-consumption ingredient of operating costs, however, has been made good through increase in other intermediary capital outlays, suggesting an almost constant relation between the fixed and circulating capital (Table 9 and Charts 16 and 17).

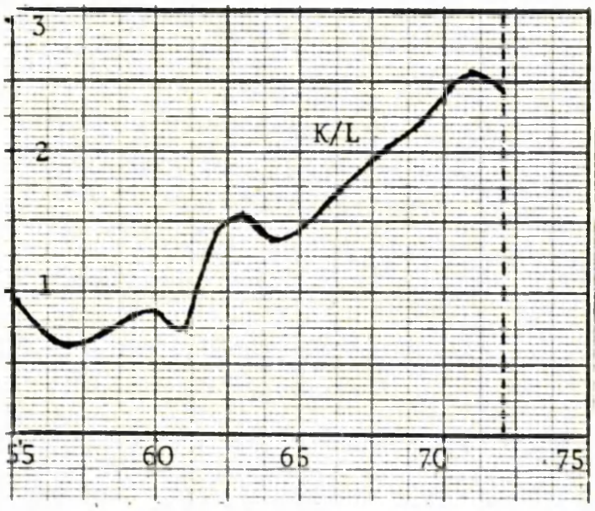


Chart 16. Capital to Labour Ratios Index (1955 = 1.000)

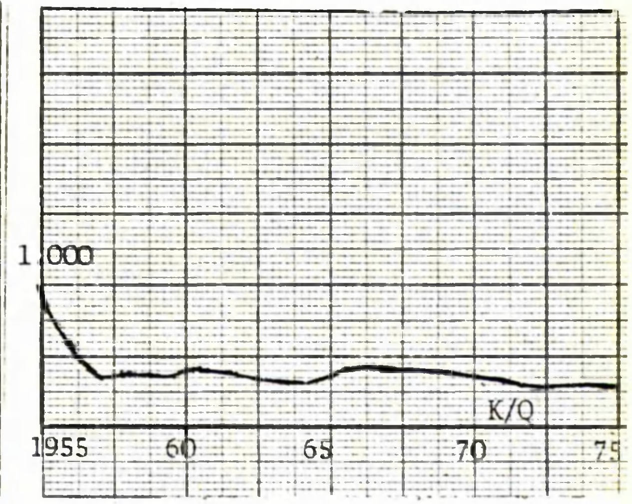


Chart 17. Capital/Output Ratios Index (1955 = 1.000)

VII.3.3. Labour. In response to the profound restructuring of capital, in this already capital intensive industry, programmes of accelerated attrition of labour force were enforced, though not without political and administrative problems (Chart 17). As a result, during the period 1955-1975, the labour requirement for a barrel of output declined more than seven times, although labour requirement per unit of capital was almost halved. To reciprocate structural variation of capital, labour too accommodated some quality change (Charts 7 and 8 above).

The declining relative share of labour in the

Table 9.

Capital to Factors Ratios   Dollars Constants of 1969.

Year	K/Q $/Bl year	K/Q Index	K/L $ year	K/L Index	K/Dep. $	Durability Index	K/Op. costs $	K/Op. costs Index	Dep/Op. cost $	Dep/Op. Cost Index
1955	3.04	1.000	3.19	1.000	4.16	1.000	1.83	1.000	0.44	1.000
1956	1.62	0.533	2.39	0.749	3.58	0.861	1.33	0.727	0.37	0.841
1957	1.14	0.375	2.10	0.658	5.21	1.252	1.12	0.612	0.22	0.500
1958	1.20	0.395	2.29	0.718	9.34	2.245	1.18	0.645	0.13	0.300
1959	1.16	0.382	2.67	0.837	8.61	2.070	1.24	0.678	0.14	0.318
1960	1.12	0.368	2.77	0.868	8.44	2.029	1.21	0.661	0.14	0.318
1961	1.34	0.441	2.34	0.734	8.24	1.981	1.10	0.601	0.13	0.300
1962	1.21	0.398	4.57	1.433	7.98	1.918	1.18	0.645	0.15	0.341
1963	1.17	0.385	5.00	1.567	7.36	1.769	1.01	0.552	0.14	0.318
1964	1.04	0.342	4.36	1.367	6.56	1.577	1.15	0.628	0.18	0.409
1965	1.06	0.349	4.58	1.436	12.63	3.036	1.38	0.754	0.11	0.250
1966	1.24	0.408	5.39	1.690	14.57	3.502	1.81	0.989	0.12	0.273
1967	1.27	0.418	6.05	1.897	14.71	3.536	1.75	0.956	0.12	0.273
1968	1.25	0.411	6.55	2.053	14.65	3.522	2.18	1.191	0.15	0.341
1969	1.23	0.405	6.88	2.157	14,55	3.498	2.32	1.268	0.16	0.364
1970	1.16	0.382	7.68	2.408	14.94	3.591	2.21	1.208	0.15	0.341
1971	1.09	0.359	8.10	2.539	14.33	3.445	1.99	1.087	0.14	0.318
1972	1.04	0.342	7.93	2.486	14.10	3.389	1.90	1.038	0.13	0.300
1973	0.96	0.316	-	-	13.62	3.274	1.77	0.967	0.13	0.300
1974	0.93	0.306	-	-	13.52	3.250	1.95	1.066	0.14	0.318
1975	0.92	0.303	-	-	13.08	3.144	1.92	1.049	0.15	0.341

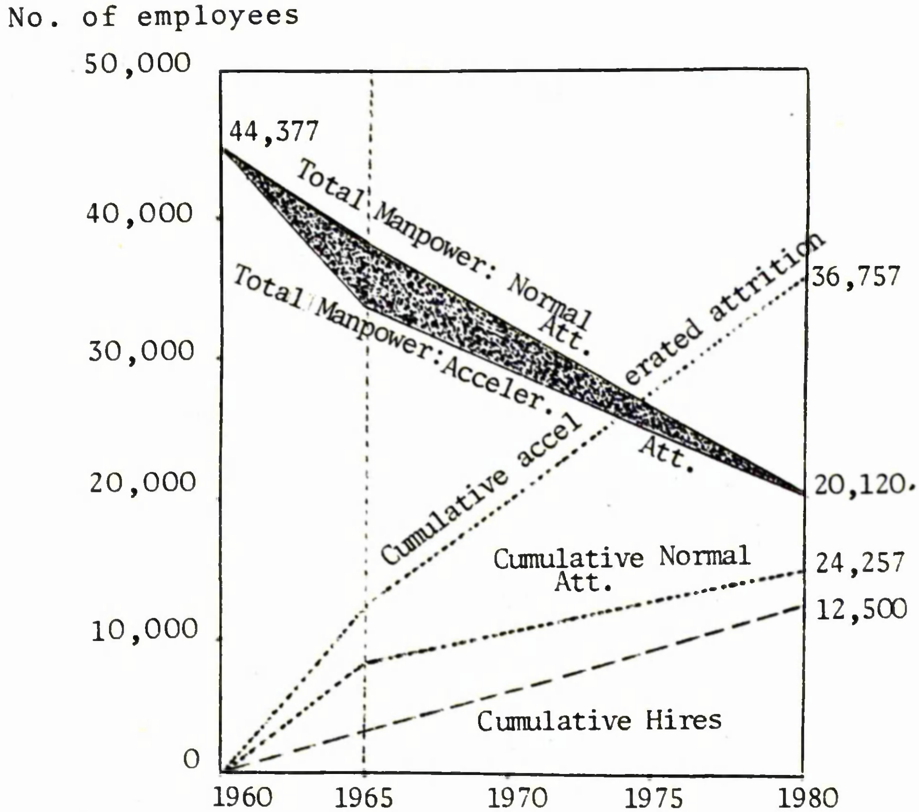


Chart 18. 1960-1980 Manpower Projection with Normal and Accelerated Attrition. Producing and Refining.

composite of operating costs, compared to an almost constant ratio of the latter to capital structures, indicates a change in favour of intermediary outlays, which is parallel to suggesting a proportionate decline of labour to both fixed and working capital (Table 10 and Charts 18 - 20).

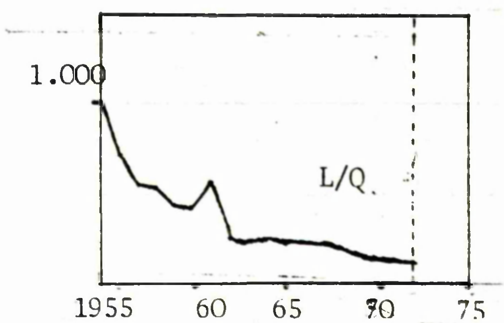


Chart 19 . Labour/Output Ratios Index (1955 = 1.000)

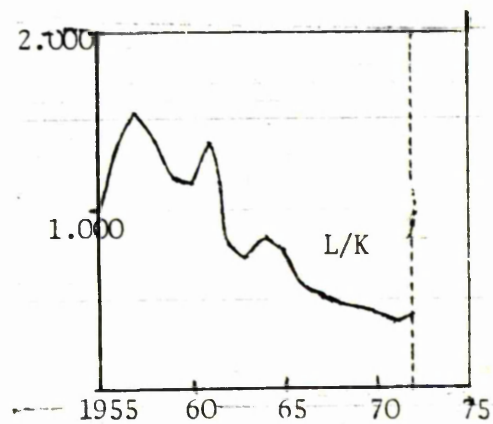


Chart 20. Labour/Capital Ratios Index (1955 = 1.000)

Table 10.
Labour Ratios

Year	L/Q $/B1	L/Q Index	L/K $	L/K Index	L/Op.Costs $	L/Op.Costs Index
1955	0.955	1.000	0.313	1.000	0.575	1.000
1956	0.681	0.713	0.419	1.339	0.556	0.967
1957	0.542	0.568	0.477	1.524	0.534	0.929
1958	0.524	0.549	0.437	1.396	0.516	0.897
1959	0.426	0.446	0.375	1.198	0.463	0.805
1960	0.402	0.421	0.361	1.153	0.435	0.757
1961	0.572	0.599	0.428	1.367	0.472	0.821
1962	0.264	0.276	0.219	0.700	0.259	0.450
1963	0.233	0.244	0.200	0.639	0.201	0.350
1964	0.238	0.249	0.229	0.732	0.263	0.457
1965	0.232	0.243	0.218	0.696	0.300	0.522
1966	0.231	0.242	0.185	0.591	0.336	0.584
1967	0.211	0.221	0.165	0.527	0.290	0.504
1968	0.191	0.200	0.153	0.489	0.332	0.577
1969	0.179	0.187	0.145	0.463	0.338	0.588
1970	0.151	0.158	0.130	0.415	0.288	0.501
1971	0.134	0.140	0.123	0.393	0.245	0.426
1972	0.131	0.137	0.126	0.403	0.240	0.417

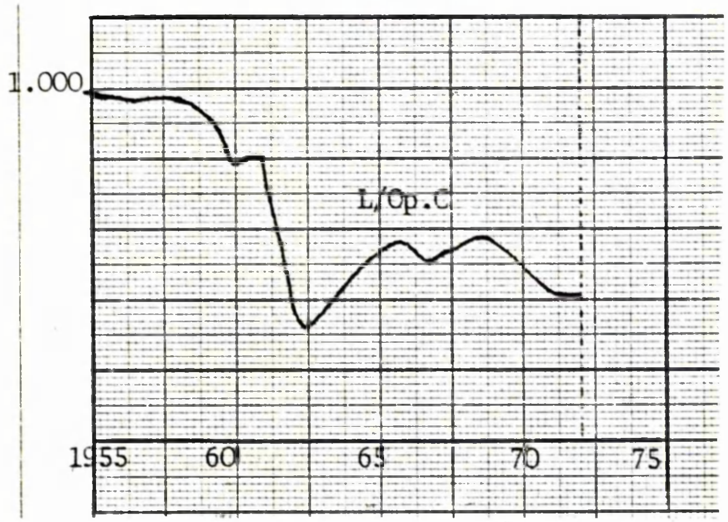


Chart 21. Labour/Operating Costs Ratios Index (1955 = 1.000)

VII.4. Productivity.[1] Neo-classical economy has taken intensive interest in the analysis of growth models combining aggregate consumption functions and aggregate production functions.[2] Only since Robert Solow introduced his salient work in 1957,[3] hundreds of elaborate contributions have been made for construction of more refined and more realistic production functions.[4] They are based on assumptions

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1. The term is slightly inaccurate in that the series really purport to describe the time profile of that part of output which is not 'explained' by the specified inputs, viz. capital and labour. See Phoebus, J. Dhrymes, 'A Comparison of Productivity Behaviour in Manufacturing and Service Industries', Review, 1963, pp. 64-69. See also Bergson, Abram, 'Index Numbers and the Computation of Factor Productivity', Review of Income and Wealth, Series 21, 1975, p. 259, and Barzel, Yoram, 'Productivity in the Electric Power Industry', Review, 1963, pp. 395-408.

2. See, for example, 'On Growth Models and the Neo-classical Resurgence', Economic Journal, LXVIII (December 1958), 714 ff. Also Thomas Iwand, 'Models of Capital Accumulation and Economic Instability', Review, 1961, pp. 56-7.

3. Solow, M. Robert, 'Technical Change and Aggregate Production Function', op.cit.

4. Numerous as such papers are, they are prohibitive of exact reference or comment. However, a selective representation is to be found in my bibliography.

ranging from constant input coefficients or zero input substitution (γ = 0) à la Walras-Leontief, Harrod and Domar to that of unitary elasticity of substitution à la Cobb-Douglas (γ = 1).

Solow built a consistent edifice of simple mathematics on the controversial assumptions of (a) constant returns to scale, (b) Constant Elasticity of Substitution (CES) or neutral technical change which is defined to mean a kind of technical change leaving marginal rates of substitution intact, and (c) a somewhat constant relationship between output per unit of labour and wage-rates which is based upon a general equilibrium assumption of factors receiving their marginal products, of neo-classical aggregate distribution theory.

The assumptions, obviously, are gross and susceptible of challenge, in that, for example, the effects of increasing returns to scale are being collected in Solow's residual or technology Index (A(t)[1] and that in determining the contribution to production of capital and labour via their respective marginal shares in marginal product one is simply projecting distribution relations into those of production, hence with a more or less equal justification one could assume the conclusion.

I am not suggesting, however, as some critiques seem to have done, that 'the puzzling uniformity of empirical

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1. Walters, A.A., 'A Note on Economies of Scale', Review, 1963, pp. 425-7.

results is due in fact to (this) law of algebra and not to some mysterious law of production'.[1] Since, once Solow's assumptions are adopted, and his formation of the functional form of production relations is accepted without challenge his results will consistently follow from his mathematics.

The problem of disentangling productivity change due to improvements in manpower as compared to that due to better technology embodied or disembodied, such as improvements in managerial grid or otpimalization of scale, will depend on assumptions which might have significance of some sort, due, for example, to constancy of shares under 'normal conditions', but in general 'our knowledge would appear to be quite weak with respect to the functional form of the relationship, and very weak with respect to the size of certain key parameters'.[2]

To be sure, Solow's assumptions do not apply in a sectoral empirical study such as the present one due to the facts that (a) Constant returns to scale is observed not to hold, (b) Output per unit of labour does not bear any consistent relationship to real wage rates, (c) The transfer-price structure of the industry does not allow any safe assumption about 'share of factor' in Solow's

1. Shaikh, Anwar, 'Law of Production and Laws of Algebra, The Humbug Production Function', Review, 1974, pp. 115-120 (emphasis mine).

2. See, Nelson, R., 'Aggregate Production Function and Economic Growth Policies, The Theory and Empirical Study of Production, NBER, Vol. 31, p. 480.

fashion, since although, 'for the economy as a whole, the level of wages may depend on the level of labour productivity, but for given industry the labour input per unit of output is adjusted to the prevailing wage level in the country, with relatively small deviations due to the profitability of the given industry'.[1]

Therefore, short of the ambition to establish functional relations between elements of inputs in order to disentangle the variations in productivity not explained by availability of labour and capital per unit of output, which would require assumptions no better than those in the literature, I have simply taken the ratio of variations in the indexes of output to those of aggregated inputs, and attributed the change to 'productivity' due to embodied or disembodied improvements, and thus concluded a productivity index A(t) (Chart 22) and incremental productivity index $\frac{\Delta A}{A}$, (Chart 23) and Table 11.

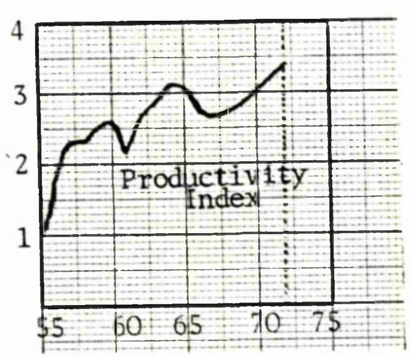


Chart 22. Productivity Index (1955 = 1.000)

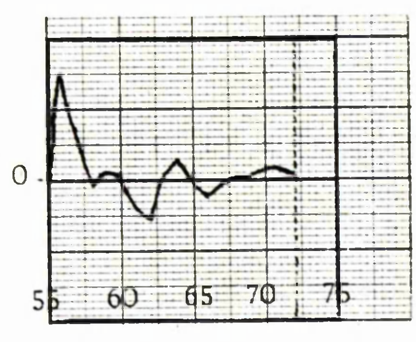


Chart 23. Incremental Productivity Index (1955 = 1.000)

1. See Arrow, Chenery, Minhas and Solow, 'Capital Labour Substitution and Economic Efficiency', Review, 1961, pp. 225-250.

Table 11.

Data for Computing Productivity Index

Year	Q Index (1)	Q/L = q Index (2)	Q/K = k Index (3)	K + L Index (4)	Q/K+L = A(t) Productivity Index (5)	$\frac{\Delta A}{A}$ (6)	q/k = r (7)
1955	1.000	1.000	1.000	1.000	1.000	-	1.000
1956	1.520	1.403	1.879	0.876	1.735	0.735	0.747
1957	2.071	1.761	2.667	0.870	2.380	0.372	0.660
1958	2.052	1.823	2.515	0.882	2.327	-0.022	0.725
1959	2.097	2.191	2.606	0.838	2.502	0.075	0.841
1960	2.295	2.375	2.727	0.871	2.635	0.053	0.872
1961	2.030	1.669	2.273	0.969	2.095	-0.205	0.734
1962	2.352	3.614	2.575	0.865	2.719	-0.298	1.437
1963	2.359	4.092	2.606	0.826	2.856	0.050	1.570
1964	2.410	4.016	2.909	0.768	3.138	0.154	1.381
1965	2.455	4.120	2.848	0.794	3.092	-0.015	1.447
1966	2.533	4.143	2.424	0.934	2.712	-0.123	1.709
1967	2.610	4.532	2.364	0.969	2.693	-0.007	1.917
1968	2.669	5.010	2.424	0.960	2.780	0.032	2.067
1969	2.752	5.333	2.455	0.971	2.834	0.019	2.172
1970	2.774	6.306	2.606	0.912	3.042	0.073	2.420
1971	2.803	7.115	2.788	0.856	3.275	0.077	2.552
1972	2.802	7.268	2.909	0.822	3.409	0.041	2.498
1973	2.874	-	3.152	-	-	-	-
1974	2.994	-	3.242	-	-	-	-
1975	3.053	-	3.303	-	-	-	-

Now, if we divide the annual output series by respective productivity index series (A(t)) we will arrive at the output with base-year-quality-inputs (Q/A(t)), and if subtract it from the actual output we will arrive at the quantity of output attributable to quality-change or 'technical change' of aggregate inputs. To illustrate them as percentage of actual output one gets the percentage 'share of technology' index (qt), which subtracted from unity yields 'share of base-year-quality-inputs series' (qI_0).

Thus the series speak their stories, that, for example, in the year 1972, 71 per cent of output was due to 'technical change' and only 29 per cent was attributable to capital and labour of the base-year quality (see Table 12 and Chart 24).

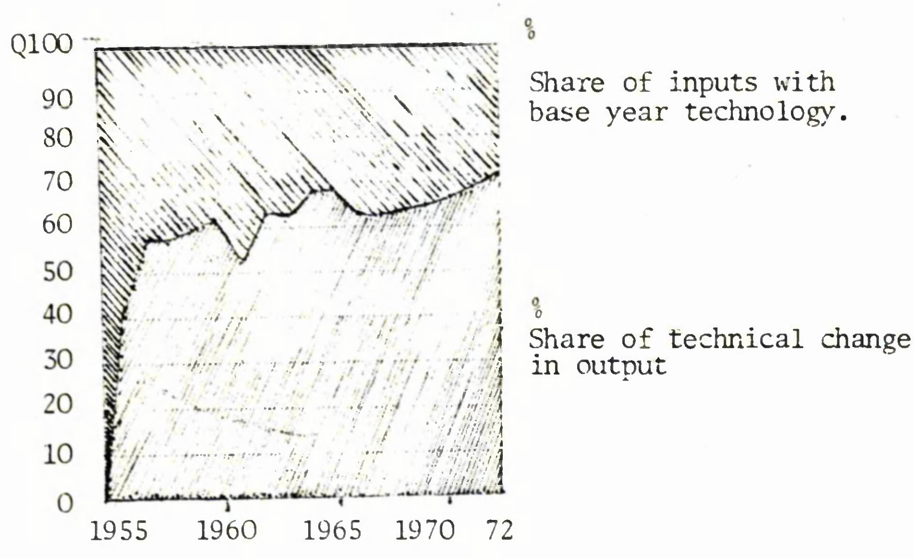


Chart 24. Share of Inputs with Base Year Technology. Percentage Share of Technical Change in Output.

Table 12.

Year	Q (000) Bl	A(t)	Q/A(t)	Q-Q/A(t) = $q_{(t)}$	q(t) %	$q(I_o)$
1955	52,041	1.000	52,041	0	0	100
1956	79,111	1,735	45,597	33,514	42	58
1957	107,770	2,380	45,282	62,488	58	42
1958	106,545	2.327	45,786	60,759	57	43
1959	109,121	2.502	43,614	65,507	60	40
1960	119,458	2,635	45,335	74,123	62	38
1961	105,624	2.095	50,417	55,207	52	48
1962	122,396	2.719	47,015	77,381	63	37
1963	122,790	2.856	45,994	76,796	63	37
1964	125,393	3.138	39,960	85,433	68	32
1965	127,760	3.092	41,320	86,440	68	32
1966	131,827	2.712	48,609	83,218	63	37
1967	135,807	2.693	50,430	85,377	63	37
1968	138,921	2.780	49,972	88,949	64	36
1969	143,231	2.834	50,540	92,691	65	35
1970	144,376	3.042	47,461	96,915	67	33
1971	145,888	3.275	44,546	101,342	69	31
1972	145,828	3.409	42,777	103,051	71	29

APPENDIXES TO CHAPTER IV

1 - 8

Appendix 1.
Iranian Oil Operating Companies' Purchases
(Million Rials) Current

Markets	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
1. Foreign Market	3558	2450	3029	2527	1883	1983	1860	1891	1827	2044
2. Domestic Market										
(a) Foreign Goods	37	102	2471	1411	1378	2344	1758	2153	1807	3859
(b) Domestic Goods	485	438	420	493	507	538	693	754	794	1867
3. Total Foreign Goods (1+2a)	3595	2552	5500	3938	3261	4327	3618	4054	3634	5903
4. Total: (1+2) or (3+2b)	4080	2990	5920	4431	3768	4865	4311	4798	4428	7770
Percentage of imports	88	86	93	89	87	89	84	84	82	76

Average percentage of imports = 86%

Source: NIOC.

Appendix 2

NIOC Purchases

(Million Rials) Current

Markets	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
1. Foreign market	361	357	414	464	736	998	877	1279	1350	2402	1528	1720	10449	11613
2. Domestic Market														
(a) Foreign Goods	36	60	48	47	62	69	107	97	95	83	101	101	141	197
(b) Domestic Goods	92	95	184	148	107	153	188	134	441	342	216	215	301	423
3. Total Foreign Goods (1+2a)	397	417	462	411	798	1067	984	1376	1445	2485	1629	1826	10590	11810
4. Total: (1+2) or (3+2b)	489	512	646	669	905	1220	1172	1510	1886	2827	1845	2036	10891	12229
Percentage of imports	81	81	72	61	88	87	84	91	77	88	88	90	97	97

Average percentage of imports = 91%

Source: NIOC

Appendix 3

Year	Building & Construction as percentage of GDFCF	Buildings as percentage of Building and Construction
1955	65	31
1956	65	31
1957	62	40
1958	61	32
1959	71	27
1960	62	22
1961	69	20
1962	68	21
1963	83	12
1964	82	9
1965	84	3
1966	52	6
1967	58	7
1968	55	3
1969	61	1
1970	66	1
1971	80	1
1972	64	2
1973	87	1
1974	81	2
1975	74	3
Average	75	5

Calculated from Bank-é Markazi Iran, Annual Reports.

APPENDIX 4

Buildings: In Wholesale Market Prices

Items	Gen. Index %	Group[1] Index %	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Non-metal building materials	2.99	35.91	95.2	99.9	107.5	111.2	115.0	114.7	110.6	91.1	88.8	85.7	93.1
Bricks (Group)	0.75	9.00						135.9	109.6	84.4	83.8	82.2	91.3
Cement "	0.62	7.45						128.1	136.1	129.1	115.1	110.1	115.1
Stones "	0.43	5.16						122.6	117.9	104.5	96.5	98.2	105.3
Mozaic "	0.42	5.04						114.3	111.4	105.7	99.2	91.5	93.9
Glasses "	0.33	3.96						94.8	97.3	90.7	95.1	81.2	84.2
Chalk "	0.15	1.80						106.0	96.4	86.7	84.8	85.5	91.4
Iranite "	0.15	1.80						114.3	111.4	105.7	99.2	91.5	93.9
Ceramic "	0.14	1.61						83.7	77.9	74.8	72.6	72.8	79.4
Basic metal building materials	3.89	46.72						64.4	69.8	67.6	65.3	60.3	63.5
Iron & Steel pipes, tubes	2.34	28.10						82.8	94.8	91.0	92.8	87.2	85.7
Iron & aluminium Profile	0.60	7.20											
Iron Bars - pillars	0.46	5.52						57.6	61.2	60.3	57.0	52.2	56.6
Edge-Pillars	0.23	2.76						86.9	93.5	83.9	79.0	73.5	77.1
Pipes	0.16	1.92											
Edged Bars	0.10	1.20											
Basic metals building materials imported	1.03	12.37	76.8	77.3	78.7	72.0	67.8	68.8	74.7	72.4	69.8	69.1	69.2
Total building materials	7.91	80	83.76	85.84	89.57	86.82	85.64	83.99	85.86	81.53	74.77	71.05	75.42
Wages[3]	0.42	20	60.70	61.70	67.10	70.10	70.80	80.0	86.3	87.7	88.5	89.4	93.3
Total Buildings[4]	8.33	100.0	79.15	81.01	85.08	83.48	82.67	83.19	85.95	82.90	77.52	74.72	79.00
			82.61	84.63	88.45	85.98	84.90	83.79	85.58	81.84	75.46	71.97	76.31

1. Revised Wholesale Price Indices in Iran, Bank Markazi, Iran, 1974.
2. Based on the ratios in 'Input-Output Table for Iranian Economy' 1965, 1972 and 1977 (the last being an estimate). Published by Ministry of Economy.
3. Source: Statistical Centre of Iran, Plan Organization, 1976
4. Our Series for Building Materials differs from that of Bank Markazi in that we have considered that imported metallic materials do also constitute a part of the total Building Materials Index. But the Bank has excluded that, appreciably on no firm ground.

1965	1966	1967	1968	1969	1970	1971	1972	1973
93.3	93.6	94.9	96.6	100.0	98.5	98.3	110.0	129.3
90.4	89.9	91.5	94.2	100.0	98.4	98.3	185.5	170.3
114.8	114.7	106.8	102.4	100.0	99.9	98.8	97.7	117.4
106.5	103.6	96.6	96.2	100.0	97.2	94.9	99.1	108.6
96.4	97.3	98.6	97.4	100.0	100.6	99.7	105.6	132.4
88.8	91.6	105.5	110.2	100.0	94.3	102.2	96.2	100.3
104.3	115.1	108.8	117.5	100.0	100.0	90.9	119.2	140.5
96.4	97.3	98.6	97.4	100.0	100.6	99.7	105.6	132.4
84.2	83.2	82.0	107.5	100.0	100.0	-	-	-
62.7	62.2	68.8	66.9	100.0	102.3	100.0	103.8	129.2
84.9	77.5	87.5	84.1	100.0	103.9	104.5	107.4	137.9
				100.0	100.2	93.1	96.8	116.6
55.3	57.0	62.3	60.7	100.0	91.8	84.8	95.1	109.3
81.7	76.9	86.6	86.1	100.0	137.9	135.8	130.6	148.5
				100.0	101.7	106.6	115.0	122.1
				100.0	102.7	100.9	98.7	139.3
69.5	68.9	72.9	71.1	100.0	103.5	102.6	105.5	134.7
75.15	74.94	79.20	78.67	100.0	101.02	99.7	106.36	129.95
93.5	94.3	95.1	96.6	100.0	101.5	107.1	113.8	126.5
79.10	78.81	82.38	82.21	100.0	101.12	101.18	107.85	129.26
76.07	75.91	80.00	79.57	100.0	101.04	100.07	106.73	123.45

APPENDIX 5

Machinery and Equipment Materials. Imports by Commodity According to Standard International Trade Classification (SITC)

In U.S. Dollars

SITC Code*	Commodity	%	1955 Weight	1955 Value	1955 Unit-Value	1955 Index	1956 W	1956 V	1956 U.V.	1956 I	1957 W	1957 V	1957 U.V.	1957 I
7184	Const. Mining, Mach.						-	-	-	-	-	-	-	-
							1.4	81.9	58.5	79.32	2.2	146.2	66.45	74.94
719	Mach. Non-electric						0.6	55.3	92.17	60.27	0.8	91.8	114.75	155.55
722	Elec. Power Mach.	14.42	2.9	113.5	39.14	39.71	3.0	232.7	77.57	78.70	4.6	379.8	82.57	83.78
723	Elec. Distrib. Mach.	8.08	0.5	63.6	127.2	46.14	0.8	187.5	234.38	85.01	1.0	251.0	251.0	91.04
724	Telecom. Equip.	13.72	1.8	108.0	60.0	43.27	2.6	398.1	153.12	110.42	1.9	275.8	145.16	104.68
725	Domestic Elect. Equip.													
729	Elect. Machines													
812	Plumbg. Heat, Light													
861	Instrum. Apparat.	5.12	0.2	40.3	201.5	37.45	0.1	95.5	955.0	177.51	0.2	111.6	558.0	103.72
862	Photo, Cinema, Suppl.													
6291	Rubber Tyre, Tubes	51.42	6.7	404.8	60.42	47.23	6.4	637.9	99.67	77.9	7.2	906.5	125.9	98.41
678	Iron, Steel, Tubes, Pipes	7.25	9.0	57.1	6.34	34.18	6.5	96.3	14.82	79.89	11.4	182.9	16.04	86.47

* These items represent groups of items, altogether consisting of 45 homogeneous categories.

		1958				1959				1960				1961	
W	V	U.V.	I	W	V	U.V.	I	W	V	U.V.	I	W	V	U.V.	I
0.3	23.3	77.67	87.48	0.5	87.4	174.8	196.87	3.3	471.6	142.91	160.95	4.1	572.9	139.73	152.37
4.6	326.4	70.96	96.22	3.6	360.0	100.0	135.59	8.3	738.4	88.96	120.62	5.6	411.0	73.39	99.51
1.6	198.0	123.75	80.92	2.0	253.3	126.65	82.82	7.3	733.4	100.47	65.70	4.4	597.9	135.89	88.86
6.8	566.2	83.26	84.48	8.1	824.9	101.84	103.33	10.4	1113.7	107.09	108.65	9.0	859.4	95.49	96.89
1.5	479.6	319.73	115.97	3.5	848.6	242.46	87.94	1.7	577.5	339.71	123.21	1.1	525.0	477.27	173.11
2.7	375.0	138.89	100.16	4.6	633.4	137.70	99.30	6.1	938.0	153.8	110.91	5.4	724.3	134.13	96.73
0.4	164.5	411.25	91.64	0.6	252.5	420.83	93.77	1.1	422.2	383.82	85.53	0.7	350.7	501.00	111.64
0.2	130.1	650.5	120.91	0.3	159.8	532.67	99.01	0.2	137.1	685.5	127.42	0.2	134.1	670.5	124.63
10.0	1160.7	116.07	90.72	12.1	1420.7	117.41	91.77	11.1	1317.1	118.66	92.75	11.5	1423.1	123.75	96.73
25.0	381.7	15.27	82.32	56.4	833.5	14.78	79.68	66.6	1094.1	16.43	88.57	62.5	1342.9	21.49	115.85

			1962		1963				1964				1965			
%	W	V	U.V.	I	W	V	U.V.	I	W	V	U.V.	I	W	V	U.V.	I
8.19	4.8	426.2	88.79	100.0	2.6	309.4	119.0	86.42	2.3	342.2	148.78	108.05	6.6	634.1	96.08	69.77
3.97	2.8	206.5	73.75	100.0												
3.53	1.2	183.5	152.92	100.0	26.9	3163.7	117.61	83.95	41.3	4444.8	107.62	76.82	62.8	6676.6	106.32	75.89
16.86	8.9	877.2	98.56	100.0	3.8	478.8	126.0	82.87	3.5	441.1	126.00	82.87	3.9	573.7	147.10	96.75
					0.3	23.9	79.67	48.09	0.8	75.2	94.00	56.74	0.8	110.9	138.63	83.68
					6.3	361.5	57.38	75.95	9.8	522.5	53.32	70.58	10.3	586.0	56.89	75.30
3.71	0.7	193.0	275.71	100.0	1.2	514.1	428.42	80.03	1.3	629.3	484.08	90.43	2.0	1030.0	515.00	962.02
4.80	1.8	249.6	138.67	100.0	1.3	172.1	132.38	104.20	1.5	237.7	158.47	124.73	3.0	503.1	167.7	132.00
					7.4	884.3	119.50	63.96	8.1	1002.2	124.69	66.68	9.6	1152.9	120.09	64.27
					2.9	200.8	69.24	96.92	3.2	199.5	62.34	97.07	4.5	275.2	61.16	95.24
7.78	0.9	403.9	448.78	100.0	0.8	374.6	468.25	96.48	1.0	446.1	446.1	919.19	1.3	616.3	474.08	97.68
2.07	0.2	107.6	538.00	100.0												
					0.5	134.4	268.8	86.34	0.6	178.4	297.33	95.50	0.7	194.4	277.71	892.01
22.13	9.0	1151.5	127.94	100.0	9.9	1172.6	118.44	133.49	9.1	981.8	107.89	121.58	10.6	1041.2	98.23	110.69
26.99	75.7	1404.6	18.55	100.0	72.1	1382.8	19.18	101.70	91.3	1654.5	18.12	96.08	224.4	3607.4	16.08	85.26

Imports by Commodity According to SITC in U.S. Dollars

*Weights in Metric Tons, Values in Million Rials.

1966 W	1966 V	1966 U.V.	1966 I	%	1967 W	1967 V	1967 U.V.	1967 I	1968 W	1968 V	1968 U.V.	1968 I	%	1969 W	1969 V	1969 U.V.	1969 I
8.8	871.5	99.03	71.92	3.84	7.0	963.9	137.70	100.0	5346	13260	2.48	108.30	2.52	5340	12241	2.29	100
86	9583.8	111.44	79.54	40.64	72.9	10213	140.10	100.0	89685	146556	1.63	81.09	42.77	103464	207798	2.01	100
6.7	1033.8	154.30	101.49	7.62	12.6	1915.7	152.04	100.0	15346	33428	2.18	101.87	8.42	19120	40924	2.14	100
1.8	212.7	118.17	713.29	1.19	1.8	298.2	165.67	100.0									
15.2	943.7	62.09	82.18	4.06	13.5	1019.9	75.55	100.0	21348	18748	0.88	85.44	4.45	21004	21602	1.03	100
1.7	872.1	513.00	95.83	3.20	1.5	803.0	535.33	100.0	3218	20989	6.52	85.01	6.91	4378	33574	7.67	100
3.1	478.2	154.26	121.42	2.93	5.8	736.9	127.05	100.0	26003	47251	1.82	80.53	3.02	6497	14664	2.26	100
8.5	1233.4	145.11	77.67	7.29	9.8	1831.0	186.84	100.0	11257	27487	2.44	81.88	9.16	14929	44514	2.98	100
5.3	353.7	66.74	10.39	1.28	5.0	321.1	64.22	100.0	6961	5382	0.77	89.53	1.06	6033	5168	0.86	100
1.6	852.6	532.88	109.80	4.25	2.2	1067.7	485.32	100.0	3004	6293	5.42	73.05	3.96	2595	19254	7.42	100
0.8	214.0	267.5	85.92	1.12	0.9	280.2	311.33	100.0	882	4602	5.22	119.45	1.00	1110	4855	4.37	100
13	1211.1	93.16	104.98	3.78	10.7	949.5	88.74	100.0	13410	15197	1.13	96.58	4.35	18078	21124	1.17	100
124.3	2452.6	19.73	104.61	18.82	250.7	4728.4	18.86	100.0	424360	84089	0.20	76.92	12.37	228494	60101	0.26	100

* Converted to the SITC, from official trade returns by the International Trade Statistics Centre of the Statistical Office of the United Nations.

1970				1971				1972				1973				1974			
W	V	U.V.	I	W	V	U.V.	I	W	V	U.V.	I	W	V	U.V.	I	W	V	U.V.	I
6628	14319	2.16	94.32	7060	20062	2.84	124.02	8728	30041	3.44	150.22	43264	104216	2.41	105.24	54220	165675	3.06	133.62
101738	216451	2.13	105.97	110120	251825	2.287	113.43	143433	318079	2.22	110.45	97801	309176	3.16	157.21	129196	452773	3.50	174.13
17384	39479	2.27	106.07	23800	54631	2.30	107.48	24514	68174	2.78	129.91	29187	93018	3.19	149.07	28276	102649	3.63	169.63
21065	25436	1.21	117.48	20589	23789	1.16	112.62	35584	41324	1.17	113.59	32533	49194	1.51	146.60	27204	49931	1.84	178.64
5265	52705	10.01	130.50	8417	115967	13.78	179.66	6346	75577	11.91	155.28	4853	63565	13.10	176.80	8536	105757	12.39	161.54
6120	14434	2.36	104.42	6202	14159	2.28	100.88	7589	18644	2.46	108.85	8795	22540	2.56	113.27	12096	35424	2.93	129.65
12690	37888	2.99	100.34	13955	48535	3.48	116.78	18282	61440	3.36	112.75	20218	78834	3.90	130.87	19284	99466	5.16	173.15
3694	4295	1.16	134.88	7863	12996	1.65	191.86	7204	10175	1.41	163.95	10848	15655	1.44	167.44	15396	20668	1.34	155.81
2606	21694	8.32	112.13	2784	26708	9.59	129.25	3104	34933	11.25	151.62	5224	48185	9.22	124.26	6855	74473	10.86	146.36
890	4618	5.19	118.76	1201	6563	5.46	124.94	1224	7773	6.35	145.31	1842	9808	5.32	121.74	2056	13113	6.38	146.00
13044	15629	1.20	102.56	13746	16713	1.22	104.27	26391	34048	1.29	110.26	31895	46135	1.45	123.93	41340	84321	2.04	174.36
95172	30520	0.32	123.77	151392	49886	0.33	126.92	299907	82998	0.28	107.69	183241	81361	0.45	173.08	331231	232803	0.70	269.23

Machinery and Equipment

Weights %	1954	1955	Weights %	1956	1957	1958	1959	1960	1961	1962	Weights %	1963	1964	1965
14.42	32.07	39.71	8.19	79.32	74.84	87.48	196.87	160.95	157.37	100.0	3.84	86.42	108.05	69.77
8.08	46.04	46.14	3.97	79.32	74.84	96.22	135.59	120.62	99.51	100.0	40.64	83.95	76.82	75.89
13.72	37.14	43.27	3.53	60.27	155.59	80.92	82.82	65.70	88.86	100.0	7.62	82.87	82.87	96.75
5.12	74.16	37.45	16.86	78.70	83.78	84.48	103.33	108.65	96.89	100.0	1.19	48.09	56.74	83.68
51.42	37.01	47.23	3.71	85.01	91.04	115.97	87.94	123.21	173.11	100.0	4.06	75.95	70.58	75.30
7.25	34.82	34.18	4.80	110.42	104.68	100.16	99.30	110.91	96.73	100.0	3.20	80.03	90.43	96.20
			7.76	177.51	103.72	91.64	93.77	85.53	111.64	100.0	2.93	104.20	124.73	132.00
			2.07			(120.91	99.01	127.42	124.63	100.0	7.29	63.96	66.68	64.27
			22.13	77.90	98.41	90.72	91.77	92.75	96.73	100.0	1.28	96.92	97.07	95.24
			26.99	79.89	86.47	82.32	79.68	88.57	115.85	100.0	4.25	96.48	91.92	97.68
											1.12	86.34	95.50	89.20
											3.78	133.49	121.58	101.69
											18.82	101.70	96.08	85.26
Index Number	38.79	44.07		82.49	92.43	89.10	101.02	103.21	111.29	100.0		88.16	84.99	82.83

	1966	1967	Weights %	1968	1969	1970	1971	1972	1973	1974
	71.92	100.0	2.52	108.30	100.0	94.32	124.04	150.22	105.24	133.62
	79.54	100.0	42.77	81.09	100.0	105.97	113.43	110.45	157.21	174.13
	101.49	100.0	8.42	101.87	100.0	106.07	107.48	129.91	149.07	169.63
	713.29	100.0	4.45	85.44	100.0	117.48	112.62	113.59	146.60	178.64
	82.18	100.0	6.91	85.01	100.0	130.50	179.66	155.28	170.80	161.54
	95.83	100.0	3.02	80.53	100.0	104.42	100.88	108.85	113.27	129.65
	121.42	100.0	9.16	81.88	100.0	100.34	116.78	112.75	130.87	173.15
	77.67	100.0	1.06	89.53	100.0	134.88	191.86	163.95	167.44	155.81
	10.39	100.0	3.96	73.05	100.0	112.13	129.25	151.62	124.26	146.36
	109.80	100.0	1.00	119.45	100.0	118.76	124.94	145.31	121.74	146.00
	85.92	100.0	4.35	96.58	100.0	102.56	104.27	110.26	123.93	174.36
	104.98	100.0	12.37	76.92	100.0	123.77	126.92	107.69	173.08	269.23
	104.61	100.0								
Index Number	96.35	100.0		84.35	100.0	110.05	120.50	118.68	149.43	180.81

APPENDIX 7

TRANSPORTATION

Weight %:	60.11	39.89	Index No.	
1955		42	42.00	31.67
1956	60.70	128.00	104.30	87.63
1957	93.46	75.41	96.07	86.26
1958	76.11	130.00	114.36	97.63
1959	86.31	75.41	91.77	81.96
1960	89.63	80.02	85.80	
1961	105.77	69.10	91.14	
1962	98.91	68.27	86.69	

Weight %:	38.96	1.27	56.87	2.90	
1963	77.96	70.54	99.70	448.93	100.98
1964	88.08	263.67	92.48	47.90	104.15
1965	89.03	113.36	95.40	620.09	108.36
1966	90.36	49.73	95.90	658.88	109.48
1967	100.00	100.00	100.00	100.00	100.00

Weight %:	34.63	2.98	60.22	2.12	
1968	109.22	191.58	91.01	96.54	100.28
1969	100.00	100.00	100.00	100.00	100.00
1970	103.07	148.42	107.87	59.79	106.34
1971	116.04	127.37	132.58	134.55	126.67
1972	118.33	197.89	143.26	101.33	138.76
1973	106.14	114.74	135.39	114.78	123.14
1974	113.31	2.36	160.67	80.43	138.77

TRANSPORTATION MATERIALS

IMPORTS BY COMMODITY ACCORDING TO STANDARD INTERNATIONAL TRADE CLASSIFICATION (SITC) IN U.S. DOLLARS

SITC Code	Commodity	$	1955 W	1955 V	1955 UV	1955 I	1956 W	1956 V	1956 UV	1956 I	1957 W	1957 V	1957 UV	1957 I	1958 W	1958 V	1958 UV	1958 I
711	Power Mach. Non-elect.	60.11					0.8	107.4	134.25	60.70	0.3	62	20.67	93.46	0.6	101	168.33	76.11
731	Railway Vehicles																	
732	Road Motor Vehicles	38.89	5874	318.5	0.05	42	7416	930.8	0.20	170	94.7	1110.4	0.21	172	12465	1451.8	0.12	100
734	Aircraft																	

SITC CODE	1959 W	1959 V	1959 UV	1959 I	1960 W	1960 V	1960 UV	1960 I	1961 W	1961 V	1961 UV	1961 I	1962 W	1962 V	1962 UV	1962 I
711	0.9	171.8	190.89	86.31	1.7	337	198.24	89.63	1.4	327.5	233.93	105.77	2.6	568.8	218.77	98.91
732	14467	1719.1	0.12	100	16.6	1708	102.90	80.02	9.5	844.2	88.86	69.10	4.3	377.5	87.79	68.27

SITC CODE	$	1963 W	1963 V	1963 UV	1963 I	1964 W	1964 V	1964 UV	1964 I	1965 W	1965 V	1965 UV	1965 I	1966 W	1966 V	1966 UV	1966 I
711	38.96	9.7	1672.6	172.43	77.96	9.1	1772.7	194.8	88.08	12.41	2441.5	126.9	89.03	14	2797.7	199.84	90.36
731	1.27	0.5	42.1	84.2	70.54	0.1	31.4	314	263.67	0.8	108.6	135	113.36	2.7	159.9	59.22	49.73
732	56.87	17.2	2205.2	128.21	99.70	35.2	4185.9	118.92	92.48	36.8	4514.3	122.67	95.40	43.4	5351.9	123.32	95.9
734	2.90	0.1	103.6	103 6	448.93	0.2	221.1	110.55	47.90	0.1	143.1	1431	620.09	0.2	304.1	1520.5	658.80

SITC CODE	1967 W	1967 V	1967 UV	1967 I	1968 W	1968 V	1968 UV	1968 I	$	1969 W	1969 V	1969 UV	1969 I	1970 W	1970 V	1970 UV	1970 I
711	18.2	4025.3	221.17	100	19413	62133	3.20	109.22	34.68	21987	64411	2.93	100	24045	72633	3.02	103.07
731	1.1	131	119.09	100	2347	4279	1.82	191.58	2.98	5817	5538	0.95	100	3672	5160	1.41	148.42
732	45.7	5876.7	128.59	100	69264	112327	1.62	91.01	60.22	62792	111854	1.78	100	58816	113133	1.92	107.87
734	1.3	300	230.77	100	238	3451	14.50	96.54	2.12	262	3936	15.02	100	358	3214	8.98	59.79

SITC CODE	1971 W	1971 V	1971 UV	1971 I	1972 W	1972 V	1972 UV	1972 I	1973 W	1973 V	1973 UV	1973 I	1974 W	1974 V	1974 UV	1974 I
711	24154	82131	3.40	116.04	35385	133146	3.76	128.33	41681	129740	3.11	106.14	48164	160063	3.32	113.31
731	18136	22025	1.21	127.37	5192	9779	1.88	197.89	18413	20093	1.09	114.74	12503	28025	2.24	236
732	46948	110845	2.36	132.58	55881	142484	2.55	143.26	99762	240368	2.41	135.39	156091	445902	2.86	160.67
734	625	12629	20.21	134.55	1031	15695	15.22	101.33	437	7533	17.24	114.78	235	9838	12.08	80.43

APPENDIX 9

TABLES 1 - 92

Table 1.

Gross Fixed Investment (GFI); Buildings; (Consortium)

(Current US 000 Dollars)

	Producing				Refining						
	Basic		Non-basic		Basic		Non-basic				
Year	(1) Resi- dential	(2) Non- resident.	(3) Resi- dential	(40 Non- resident.	(5) Resi- dential	(6) Non- resident.	(7) Resi- dential	(8) Non- resident.	(1)+(3)+ (5)+(7)=9 Total resident.	(2)+(4)+ (6)+(8)=10 Total non- resident.	(9)+(10) = 11 Grand Total
1955	--	172	585	103	--	80	273	48	858	403	1,261
1956	--	492	1,677	296	--	149	507	89	2,183	1,026	3,209
1957	--	64	3,785	541	--	573	5,633	47	9,419	1,225	10,644
1958	--	3,163	5,745	1,754	--	241	4,830	260	10,575	5,418	15,994
1959	--	3,684	5,954	2,168	--	848	2,245	204	8,199	6,606	14,805
1960	680	2,550	1,364	632	46	972	1,541	183	3,632	4,337	7,969
1961	97	1,241	1,906	451	(17)[1]	23	3,176	319	5,163	2,034	7,197
1962	--	964	1,062	993	--	184	4,164	1,238	5,226	3,379	8,605
1963	--	307	792	790	--	94	2,015	1,243	2,807	2,434	5,241
1964	--	28	2,235	351	--	--	301	457	2,536	836	3,371
1965	--	118	1,293	706	--	28	--	184	1,293	1,035	2,328
1966	--	60	949	720	--	237	29	262	978	1,280	2,258
1967	--	33	1,442	363	--	96	110	468	1,553	961	2,514
1968	--	15	29	790	--	--	56	237	85	1,042	1,127
1969	--	196	8	231	--	3	156	121	164	551	714
1970	--	132	27	59	--	28	131	198	159	416	575
1971	--	116	241	104	--	116	154	28	395	364	760
1972	--	165	241	285	--	55	132	214	373	720	1,093
1973	--	151	71	388	--	477	266	112	337	1,128	1,465
1974	75	934	4,343	410	--	325	189	17	4,606	1,087	6,292
1975	559	1,694	10,489	555	--	376	6	11	11,053	2,636	13,689

Totals may not add up due to rounding.

1. Figures in brackets are negative.

Table 2.

Gross Fixed Investment (GFI); Buildings: Consortium

(In constant US 000 Dollars) (1969)

Year	Producing				Refining				(1)+(3)+(5)+(7)=9	(2)+(4)+(6)+(8)=10	(9)+(10) = 11
	Basic		Non-basic		Basic		Non-basic				
	(1) Resi-dential	(2) Non-resident.	(3) Resi-dential	(4) Non-resident.	(5) Resi-dential	(6) Non-resident.	(7) Resi-dential	(8) Non-resident.	Total Resident.	Total non-resident.	Grand Total
1955	--	212	722	127	--	99	337	59	1,059	496	1,556
1956	--	578	1,971	348	--	175	596	105	2,566	1,206	3,772
1957	--	77	4,534	648	--	686	6,748	57	11,283	1,468	12,751
1958	--	3,826	6,950	2,122	--	292	5,842	315	12,792	6,554	19,346
1959	--	4,439	7,157	2,607	--	659	2,699	249	9,856	7,941	17,796
1960	791	2,967	1,587	735	54	1,131	1,793	213	4,225	5,046	9,271
1961	117	1,297	2,300	544	(20)[1]	28	3,831	385	6,228	2,454	8,682
1962	--	1,244	1,370	1,280	--	237	5,371	1,597	6,741	4,359	11,100
1963	--	410	1,061	1,057	--	126	2,697	1,664	3,757	3,257	7,014
1964	--	36	2,829	444	--	--	381	578	3,210	1,058	4,268
1965	--	149	1,635	892	--	35	--	232	1,635	1,308	2,943
1966	--	77	1,204	914	--	300	37	333	1,241	1,624	2,865
1967	--	40	1,751	440	--	117	134	569	1,885	1,167	3,052
1968	--	18	35	961	--	--	68	288	104	1,267	1,370
1969	--	196	8	231	--	3	156	121	164	551	714
1970	--	130	27	58	--	27	130	196	157	412	568
1971	--	115	239	103	--	114	152	28	391	360	751
1972	--	153	223	265	--	51	123	199	346	668	1,014
1973	--	117	55	300	--	369	206	87	261	873	1,133
1974	51	636	2,956	279	--	222	128	12	3,136	1,148	4,284
1975	340	1,024	6,376	337	--	228	3	7	6,718	1,602	8,321

Totals may not add up due to rounding.

1. Figures in brackets are negative.

Table 3

Gross Fixed Investment; Construction: Consortium

(Current U.S. 000 Dollars)

Year	Producing Basic (1) Oil Const.	Producing Basic (2) Non Oil	Producing Non-Basic (3) Oil Const.	Producing Non-Basic (4) Non Oil	Refining Basic (5) Oil Const.	Refining Basic (6) Non Oil	Refining Non-Basic (7) Oil Const.	Refining Non-Basic (8) Non Oil	(1)+(3)+(5)+(7) = (9) Total Oil	(2)+(4)+(6)+(8) = (10) Total Non-Oil	(9)+(10) = (11) Grand Total
1955	1,704	120	--	47	795	56	--	22	2,499	245	2,745
1956	4,884	345	--	135	1,477	104	--	41	6,360	624	6,985
1957	14,837	836	--	319	72	2	--	88	14,909	1,244	16,153
1958	29,832	2,803	--	405	102	96	--	541	29,934	3,846	33,778
1959	36,765	1,780	--	330	539	279	--	582	37,304	2,971	40,275
1960	24,044	3,066	153	158	374	743	--	226	24,572	4,193	28,765
1961	26,401	752	--	323	802	798	--	263	27,203	2,136	29,339
1962	29,146	1,300	--	460	975	435	44	330	30,165	2,524	32,689
1963	34,797	1,163	--	690	768	427	76	401	35,641	2,682	38,323
1964	30,465	422	--	324	1,082	33	--	770	31,547	1,550	33,097
1965	77,015	88	--	122	5,721	680	--	385	82,735	1,275	84,010
1966	22,274	147	--	324	3,906	6,082	--	837	26,180	7,389	33,570
1967	26,859[1]	247	--	433	2,539	1,389	2	393	29,401	2,461	31,861
1968	35,309[2]	125	7	702	318	217	43	278	35,677	1,322	36,999
1969	56,394[3]	1,480	5	450	30	57	33	418	56,462	2,405	58,867
1970	36,093[4]	597	--	299[5]	259	23	--	190	36,353	1,110	37,462
1971	86,441[6]	834[7]	--	91	23	31	--	198	86,464	1,153	87,617
1972	66,727	939[8]	--	153	2,926	175	--	262	69,654	1,529	71,183
1973	140,260	2,450	--	120	(121)	347	--	102	140,152	3,020	143,172
1974	236,337	3,752	--	361	10,479	168	--	135	246,164	4,415	251,231
1975	422,725	8,836	--	546	8,039	259	--	72	430,764	9,713	440,477

1. Excludes $2,043 for survey operations.
2. Excludes $2,790 for survey operations.
3. Excludes $2,207 for survey operations.
4. Excludes $1,451 for survey operations.
5. Excludes $6 for land.
6. Includes $9,913 for exploration and drilling.
7. Includes $301 for improvement and maintenance.
8. Includes $356 for road improvement and maintenance.

Totals may not add up due to rounding.

Figures in brackets are negative.

Table 4.

Gross Fixed Investment; Construction: Consortium.

(In Constant 1969 U.S. 000 Dollars)

Year	Producing				Refining				(1)+(3)+(5)+(7) = (9)	(2)+(4)+(6)+(8) = (10)	(9)+(10) = (11)
	Basic		Non-Basic		Basic		Non-Basic				
	(1) Oil Const.	(2) Non oil	(3) Oil Const.	(4) Non oil	(5) Oil Const.	(6) Non oil	(7) Oil Const.	(8) Non oil	Total Oil	Total Non-oil	Grand Total
1955	2,622	185	--	72	1,223	86	--	34	3,845	377	4,222
1956	7,047	497	--	194	2,131	150	--	59	9,178	901	10,079
1957	20,780	1,171	--	446	101	2	--	124	20,880	1,743	22,623
1958	40,582	3,813	--	551	139	131	--	736	40,721	5,232	45,953
1959	47,903	2,319	--	431	702	363	--	758	48,604	3,871	52,475
1960	31,328	3,994	200	206	488	969	--	294	32.015	5,464	37,479
1961	34,162	973	--	418	1,038	1,033	--	340	35,200	2,764	37,965
1962	37,376	1,667	--	590	1,250	558	57	423	38,683	3,237	41,920
1963	43,355	1,449	--	860	957	532	95	500	44,407	3,341	47,748
1964	36,870	511	--	392	1,309	41	--	932	38,179	1,876	40,055
1965	90,510	103	--	144	6,723	799	--	452	97,233	1,498	98,731
1966	25,392	168	--	369	4,453	6,933	--	954	29,845	8,424	38,269
1967	30,020	276	--	484	2,838	1,552	3	439	32,861	2,751	35,611
1968	37,270	132	8	741	336	229	45	294	37,658	1,395	39,053
1969	56,394	1,480	5	450	30	57	33	418	56,462	2,405	58,867
1970	35,168	582	--	292	253	23	--	185	35,421	1,081	36,502
1971	78,206	754	--	82	21	28	--	179	78,227	1,043	79,270
1972	53,899	758	--	124	2,364	141	--	212	56,264	1,285	57,499
1973	96,558	1,687	--	83	(83)	239	--	71	96,484	2,079	98,563
1974	143,174	2,273	--	219	6,348	102	--	82	149,127	8,675	151,802
1975	228,648	4,779	--	295	4,348	140	--	39	232,997	5,254	238,250

Totals may not add up due to rounding.

Table 5.

Gross Fixed Investment; Machinery and Equipment: Consortium

(Current US 000 Dollars)

Year	Producing				Refining				(1)+(3)+(5)+(7) = (9)	(2)+(4)+(6)+(8) = (10)	(9)+(10) = (11)
	Basic		Non-Basic		Basic		Non-Basic				
	(1) Mach.	(2) Equip.	(3) Mach.	(4) Equip.	(5) Mach.	(6) Equip.	(7) Mach.	(8) Equip.	Total Machinery	Total Equipment	Grand Total
1955	643	387	15	64	300	181	7	30	966	662	1,628
1956	1,845	1,110	44	184	558	336	13	56	2,459	1,685	4,145
1957	8,201	482	23	327	1,737	1,051	--	750	9,961	2,611	12,572
1958	10,695	8,383	285	778	2,121	984	13	407	13,114	10,552	23,667
1959	7,161	6,957	107	691	1,103	804	306	148	8,677	8,601	17,278
1960	3,080	2,384[1]	110	299	3,597	1,763	76	709	6,864	5,156	12,020
1961	3,977	710	233	378	7,246	2,552	192	709	11,648	4,349	15,997
1962	7,674	701	22	238	4,225	2,747	56	1,305	11,978	4,990	16,968
1963	2,233	562	74	298	2,542	1,530	76	689	4,924	3,078	8,002
1964	2,989	1,958	42	406	777	875	8	332	3,815	3,571	7,387
1965	3,032	7,198	27	1,141	3,945	578	52	636	7,056	9,553	16,609
1966	10,180	2,780	46	703	16,463	427	45	541	26,734	4,452	31,185
1967	12,348	378	29	687	7,793	1,151	11	925	20,181	3,141	23,322
1968	17,244	3,242	4	603	7,702	163	129	311	25,079	4,320	29,399
1969	17,143	5,389	9	397	12,650	475	74	347	29,876	6,608	36,483
1970	9,695	5,941	35	474	806	903	77	165	10,613	7,483	18,096
1971	19,274	555	11	178	193	529	15	169	19,493	1,431	20,924
1972	36,265	3,078	10	51	243	557	18	179	36,536	3,864	40,400
1973	17,683	5,282	140	139	645	481	75	134	18,542	6,040	24,581
1974	48,615	2,399	69	589	878	561	18	265	49,580	3,814	53,394
1975	141,022	3,396	80	716	2,299	789	3	316	143,405	5,217	148,622

1. Excludes $56 for survey and maintenance.
2. Excludes $9,610 for natural gas supply to Abadan refinery.

Totals may not add up due to rounding.

Table 6.

Gross Fixed Investment; Machinery and Equipment: Consortium

(In constant 1969 US 000 Dollars)

Year	Producing				Refining				(1)+(3)+(5)+(7) = (9)	(2)+(4)+(6)+(8) = (10)	(9)+(10) = (11)
	Basic		Non-Basic		Basic		Non-Basic				
	(1) Mach.	(2) Equip.	(3) Mach.	(4) Equip.	(5) Mach.	(6) Equip.	(7) Mach.	(8) Equip.	Total Machinery	Total Equipment	Grand Total
1955	2,374	1,429	56	237	1,108	667	26	111	3,565	2,443	6,008
1956	3,636	2,188	86	364	1,099	661	26	110	4,847	3,322	8,170
1957	14,428	849	40	576	3,057	1,850	--	1,319	17,525	4,593	22,118
1958	19,517	15,298	520	1,420	3,870	1,795	24	742	23,931	19,256	43,187
1959	11,526	11,198	173	1,113	1,775	1,295	492	238	13,967	13,843	27,810
1960	4,853	3,757	173	471	5,668	2,778	120	1,118	10,814	8,124	18,938
1961	5,811	1,037	341	552	10,587	3,729	280	1,036	17,020	6,354	23,373
1962	12,478	1,139	36	386	6,870	4,467	91	2,121	19,476	8,114	27,590
1963	3,572	898	118	476	4,066	2,447	122	1,102	7,877	4,924	12,801
1964	4,959	3,249	69	674	1,289	1,452	14	551	6,330	5,926	12,256
1965	5,163	12,256	47	1,943	6,717	985	88	1,082	12,015	16,266	28,281
1966	14,901	4,070	68	1,029	24,096	625	65	792	39,130	6,516	45,646
1967	17,413	533	41	969	10,991	1,623	15	1,304	28,460	4,429	32,889
1968	20,443	3,844	5	715	9,131	193	153	369	29,732	5,121	34,854
1969	17,143	5,389	9	397	12,650	475	74	347	29,876	6,608	36,483
1970	8,809	5,398	32	431	732	821	70	150	9,644	6,799	16,443
1971	15,995	460	9	148	160	439	13	140	16,176	1,188	17,364
1972	30,557	2,593	8	43	205	469	15	151	30,786	3,255	34,041
1973	11,834	3,535	93	93	432	322	50	90	12,408	4,042	16,450
1974	26,887	1,327	38	326	486	310	10	147	27,421	2,109	29,531
1975	62,900	1,515	86	319	1,025	352	2	141	63,963	2,327	66,290

Totals may not add up due to rounding.

Table 7.

Gross Fixed Investment; Transportation (Consortium)

(Current US (000) Dollars)

Year	Producing		Refining		
	Basic	Non-basic	Basic	Non-basic	Total
1955	227	-	106	-	333
1956	652	-	197	-	841
1957	2,359	-	229	-	2,588
1958	4,093	-	484	-	4,577
1959	3,464	-	330	-	3,794
1960	5,739	10	680	-	6,429
1961	2,248	25	191	-	2,464
1962	1,245	-	698	-	1,943
1963	388	-	300	-	688
1964	293	-	367	-	660
1965	270	-	529	-	799
1966	1,216	-	990	-	2,207
1967	1,031	-	172	-	1,203
1968	768	-	308	-	1,076
1969	476	-	491	-	967
1970	43	-	495	-	538
1971	528	-	352	-	880
1972	93	-	444	-	537
1973	1,250	-	718	-	1,967
1974	6,750	-	526	-	7,255
1975	6,131	-	2,294	-	8,425

Totals may not add up due to rounding.

Table 8.
Gross Fixed Investment; Transportation: Consortium
Constant US (000) Dollars (1969)

Year	Producing		Refining		
	Basic	Non-basic	Basic	Non-basic	Total
1955	741	-	346	-	1,087
1956	744	-	225	-	959
1957	2,868	-	279	-	3,147
1958	4,193	-	496	-	4,688
1959	4,227	-	403	-	4,630
1960	7,128	13	845	-	7,985
1961	2,628	29	225	-	2,881
1962	1,530	-	858	-	2,389
1963	409	-	317	-	726
1964	300	-	376	-	676
1965	266	-	520	-	786
1966	1,184	-	964	-	2,148
1967	1,099	-	183	-	1,282
1968	765	-	307	-	1,073
1969	476	-	491	-	967
1970	41	-	465	-	506
1971	417	-	278	-	695
1972	67	-	320	-	387
1973	1,015	-	583	-	1,598
1974	4,849	-	379	-	5,228
1975	3,945	-	1,476	-	5,421

Totals may not add up due to rounding.

Table 9.

Gross Fixed Investment; Miscellaneous: Consortium
(Current US (000) Dollars)

Year	Producing		Refining		
	Basic	Non-basic	Basic	Non-basic	Total
1955	120	12	56	6	193
1956	343	35	104	10	491
1957	705	4	452	1	1,162
1958	2,381	302	325	240	3,247
1959	1,626	3	272	31	1,932
1960	3,415	28	178	44	3,665
1961	104	76	255	23	458
1962	90	2	23	56	371
1963	139	(3)	143	125	403
1964	152	(42)	212	(396)	(71)
1965	93*	(4)**	(859)	24	(746)
1966	128	-	(193)	3	(62)
1967	56	(25)	156	7	193
1968	179	-	204	20	404
1969	149	12	330	12	503
1970	245	21	119	25	410
1971	33	26	161	2	223
1972	274	14	137	14	439
1973	95	30	141	3	269
1974	492	1	138	11	642
1975	6,668	4	130	20	6,818

* $53 deducted for land

** $4 deducted for land

Figures in brackets are negative.

Totals may not add up due to rounding.

Table 10.

Gross Fixed Investment; Miscellaneous: Consortium
(Constant US (000) Dollars) (1969)

Year	Producing		Refining		
	Basic	Non-Basic	Basic	Non-Basic	Total
1955	236	24	110	11	381
1956	548	55	166	17	786
1957	1,067	6	684	2	1,760
1958	3,542	449	484	356	4,831
1959	2,297	5	384	43	2,729
1960	4,757	39	248	61	5,105
1961	141	103	345	30	619
1962	126	3	310	78	517
1963	188	(4)	194	170	548
1964	205	(56)	285	(533)	(96)
1965	124	(5)	(1,143)	32	(993)
1966	159	-	(240)	4	(77)
1967	68	(30)	189	8	235
1968	197	-	225	22	445
1969	149	12	330	12	503
1970	232	20	113	24	389
1971	29	23	141	2	195
1972	225	12	112	11	360
1973	65	21	96	2	183
1974	288	-	81	7	238
1975	3,341	2	65	10	3,418

Totals may not add up due to rounding
Figures in brackets are negative

Table 11.
Gross Fixed Investment; Consortium
(Current US (000) Dollars)

Year	Buildings	Construction	Mach. & Equipment	Transportation	Miscellaneous	Total
1955	1,261	2,745	1,628	333	193	6,160
1956	3,209	6,985	4,145	841	491	15,671
1957	10,644	16,153	12,572	2,588	1,162	43,119
1958	15,994	33,780	23,667	4,577	3,247	81,265[1]
1959	14,805	40,275	17,278	3,794	1,932	78,084
1960	7,969	28,765	12,020	6,429	3,665	58,848
1961	7,197	29,339	15,997	2,464	458	55,455[2]
1962	8,605	32,689	16,968	1,943	371	60,576[3]
1963	5,241	38,323	8,002	688	403	52,657[4]
1964	3,371	33,097	7,387	660	(71)	44,445[5]
1965	2,328	84,010	16,609	799	(746)	103,000
1966	2,258	33,570	31,185	2,207	(62)	69,158
1967	2,514	31,861	23,322	1,203	193	59,094[6]
1968	1,127	36,999	29,399	1,076	404	69,023
1969	714	58,867	36,483	967	503	97,534
1970	575	37,462	18,096	538	410	57,081
1971	760	87,617	20,924	880	223	110,404
1972	1,093	71,183	40,400	537	439	113,653
1973	1,465	143,172	24,581	1,967	269	171,454[7]
1974	6,292	251,231	53,394	7,255	642	318,815[8]
1975	13,689	440,477	148,622	8,425	6,818	618,031

1. Excludes \$214 for survey operations.
2. Excludes \$27 for maintenance; inc. \$7 for adjustment.
3. Excludes \$7 for maintenance; includes \$231 for Tehran Head Office (according to type).
4. Includes \$197 for Tehran Head Office.
5. Excludes \$20 for maintenance.
6. Excludes \$9 for cancellation.
7. Excludes \$2,945 for exploration; excludes \$377 for land.
8. Excludes \$4,480 for exploration and \$212 for land.
9. Excludes \$8,280 for exploration and \$888 for land.

Table 12.
Gross Fixed Investment; Consortium
(Constant 1969 US (000) Dollars)

Year	Buildings	Cons-truction	Mach. & Equipment	Transpor-tation	Miscel-laneous	Total
1955	1,556	4,222	6,008	1,087	381	13,255
1956	3,772	10,079	8,170	959	786	23,767
1957	12,751	22,623	22,118	3,147	1,760	62,398
1958	19,346	45,953	43,187	4,688	4,831	118,006
1959	17,796	52,475	27,810	4,630	2,729	105,350
1960	9,271	37,479	18,938	7,985	5,105	78,779
1961	8,682	37,965	23,373	2,881	619	73,520
1962	11,100	41,920	27,590	2,389	517	83,515
1963	7,014	47,748	12,801	726	548	68,838
1964	4,268	40,055	12,256	676	(96)	57,158
1965	2,943	98,731	28,281	786	(993)	129,748
1966	2,865	38,269	45,646	2,148	(77)	88,851
1967	3,052	35,611	32,889	1,282	235	73,069
1968	1,370	39,053	34,854	1,073	445	76,795
1969	714	58,867	36,483	967	503	97,534
1970	568	36,502	16,443	506	389	54,409
1971	751	79,270	17,364	695	195	98,275
1972	1,014	57,499	34,041	387	360	93,301
1973	1,133	98,563	16,450	1,598	183	117,927
1974	4,284	151,802	29,531	5,228	376	191,220
1975	8,321	238,250	66,290	5,421	3,418	321,700

Totals may not add up due to rounding.
Figures in brackets are negative.

Table 13.

Gross Fixed Investment; Buildings: National Iranian Oil Company (NIOC)

Current US (000) Dollars

Year	Producing		Refining		Total	Total	Total
	Residential	Non-Resident.	Residential	Non-Resident.	Residential	Non-Resident.	Buildings
1964	98	2,024	-	-	98	2,024	2,122
1965	426	1,270	-	-	426	1,270	1,696
1966	23	643	-	-	23	643	665
1967	790	2,963	-	-	790	2,963	3,753
1968	738	2,513	-	-	738	2,513	3,252
1969	2,656	2,257	-	17	2,656	2,274	4,930
1970	1,159	5,429	-	12,519	1,159	17,947	19,106
1971	156	1,958	-	196	156	2,154	2,310
1972	3,070	(3,446)	3	24,281	3,073	20,835	23,908
1973	154	2,586	971	81,747	1,125	84,333	85,458
1974	643	9,766	1,928	50,374	2,570	60,140	62,710
1975	1,313	25,388	265	3,746	1,578	29,134	30,712

Totals may not add up due to rounding.

Figures in brackets are negative.

Table 14

Gross Fixed Investment; Buildings: NIOC

Constant US (000) Dollars,1969

Year	Producing		Refining		Total	Total	Total
	Residential	Non-resident.	Residential	Non-resident.	Residential	Non-resident.	Buildings
1964	124	2,562	-	-	124	2,562	2,686
1965	539	1,606	-	-	539	1,606	2,145
1966	29	816	-	-	29	816	844
1967	959	3,597	-	-	959	3,597	4,556
1968	898	3,056	-	-	898	3,056	3,953
1969	2,656	2,257	-	17	2,656	2,274	4,930
1970	1,146	5,368	-	12,380	1,146	17,748	18,894
1971	154	1,935	-	194	154	2,129	2,283
1972	2,847	(3,195)	2	22,514	2,850	19,319	22,168
1973	119	2,001	751	63,242	870	65,243	66,113
1974	437	6,648	1,312	34,294	1,750	40,942	42,692
1975	798	15,432	161	2,277	959	17,709	18,668

Totals may not add up due to rounding.

Figures in brackets are negative.

Table 15.

Gross Fixed Investment; Constructions: NIOC

Current US (000) Dollars

Year	Producing		Refining				
	Oil-Industry	Non-oil	Oil-Industry	Non-oil	Total Oil Industry	Total Non-oil	Total Constructio
1964	10,710	21	359	-	11,069	21	11,090
1965	1,124	248	57,713	-	58,837	248	59,086
1966	599	88	48,956	-	48,855	88	48,943
1967	78,924	248	-	-	78,924	248	79,172
1968	182,460	5,890	11,602	117	194,062	6,007	200,069
1969	171,521	10,674	9,033	3	180,553	10,678	191,231
1970	130,607	1,058	558	48	131,165	1,105	132,270
1971	62,572	3,034	564	143	63,186	3,177	66,313
1972	123,298	1,249	83	65	123,381	1,314	124,695
1973	93,130	552	17	62	93,147	614	93,761
1974	29,703	2,576	30,549	47	60,253	2,624	62,876
1975	109,226	5,271	91,748	69	200,975	5,339	206,314

Totals may not add up due to rounding.

Table 16

Gross Fixed Investment; Construction: NIOC

Constant US (000) Dollars, 1969

Year	Producing		Refining		Total	Total	Total
	Oil-const.	Non-oil	Oil-const.	Non-oil	Oil-const.	Non-oil	Construction
1964	12,961	25	435	-	13,396	25	13,421
1965	1,321	291	67,826	-	69,147	292	69,439
1966	658	100	55,809	-	55,695	100	55,795
1967	88,213	277	-	-	88,213	277	88,490
1968	192,590	6,217	12,246	123	204,836	6,340	211,176
1969	171,521	10,674	9,033	3	180,553	10,678	191,231
1970	127,260	1,031	544	47	127,804	1,049	128,853
1971	56,611	2,745	510	129	57,121	2,875	59,996
1972	99,595	1,009	67	53	99,662	1,062	100,723
1973	64,112	380	12	43	64,124	423	64,547
1974	17,994	1,561	18,507	29	36,501	1,589	38,090
1975	59,080	2,851	49,626	37	108,706	2,888	111,594

Totals may not add up due to rounding.

Table 17

Gross Fixed Investment; Machinery and Equipment: NIOC

Current US (000) Dollars

Year	Producing		Refining		Total	Total	
	Machinery	Equipment	Machinery	Equipment	Machinery	Equipment	Grand Total
1964	-	105	-	-	-	105	105
1965	228	27	1	-	300	27	257
1966	25	23	-	-	25	23	304
1967	1,303	13	334	-	1,637	13	1,650
1968	2,016	190	1,153	78	3,169	269	3,438
1969	14,716	96	1,201	-	15,917	96	16,013
1970	4,181	82	10,874	85	15,055	167	15,222
1971	3,234	120	25,471	15	28,705	135	28,840
1972	7,878	398	46,190	323	54,068	721	54,788
1973	9,936	87	8,547	2,666	18,483	2,751	21,236
1974	5,027	129	12,841	955	17,868	1,084	18,952
1975	1,876	1,582	1,674	6,916	3,550	3,498	12,048

Totals may not add up due to rounding.

Table 18.

Gross Fixed Investment; Machinery and Equipment: NIOC

Constant US (000) Dollars, (1969).

Year	Producing		Refining		Total Machinery	Total Equipment	Total Machinery & Equipment
	Machinery	Equipment	Machinery	Equipment			
1964	-	174	-	-	-	174	174
1965	389	46	2	-	391	46	437
1966	37	33	-	-	37	33	70
1967	1,837	19	471	-	2,308	19	2,327
1968	2,390	226	1,367	93	3,757	319	4,076
1969	14,716	96	1,201	-	15,917	96	16,013
1970	3,800	75	9,881	77	13,681	152	13,832
1971	2,684	100	21,138	12	23,822	112	23,934
1972	6,638	335	38,920	272	45,557	607	46,165
1973	6,649	58	5,720	1,784	12,369	1,842	14,211
1974	2,780	71	7,102	528	9,882	599	10,482
1975	837	706	747	3,085	1,583	3,790	5,374

Totals may not add up due to rounding.

Table 19.
Gross Fixed Investment; Transportation and Miscellaneous: NIOC
Current US (000) Dollars

Year	Producing		Refining		Total	Total
	Transportation	Miscellaneous	Transportation	Miscellaneous	Transportation	Miscellaneous
1964	2,652	481	44	-	2,696	481
1965	1,129	309	44	192	1,173	501
1966	959	152	119	-	1,077	152
1967	1,944	724	94	-	2,038	724
1968	4,024	1,685	81	74	4,104	1,759
1969	3,310	2,493	209	-	3,519	2,493
1970	2,497	2	75	-	2,572	2
1971	12,785	-	124	-	12,909	-
1972	4,307	-	293	1,121	4,600	1,121
1973	2,624	-	209	-	2,833	-
1974	4,887	-	268	-	5,154	-
1975	6,136	-	260	-	6,396	-

Totals may not add up due to rounding.

Table 20.

Gross Fixed Investment; Transportation and Miscellaneous: NIOC

Constant 1969 US (000) Dollars

Year	Producing		Refining		Total	Total
	Transportation	Miscellaneous	Transportation	Miscellaneous	Transportation	Miscellaneous
1964	2,713	648	45	-	2,758	648
1965	1,110	412	43	255	1,153	667
1966	933	189	116	-	1,049	189
1967	2,071	878	101	-	2,172	878
1968	4,012	1,857	81	82	4,093	1,938
1969	3,310	2,493	202	-	3,519	2,493
1970	2,348	2	71	-	2,419	2
1971	10,093	-	98	-	10,191	-
1972	3,104	-	211	920	3,315	920
1973	2,131	-	170	-	2,301	-
1974	3,521	-	193	-	3,714	-
1975	3,948	-	167	-	4,115	-

Totals may not add up due to rounding.

Table 21.

Gross Fixed Investment; National Iranian Oil Company

Current US (000) Dollars

Year	Buildings	Construction	Machinery & Equipment	Transportation	Miscellaneous	Total
1957	-	-	-	-	-	15,884
1958	-	-	-	-	-	18,470
1959	-	-	-	-	-	27,828*
1960	-	-	-	-	-	40,603
1961	-	-	-	-	-	16,024
1962	-	-	-	-	-	8,032
1963	-	-	-	-	-	15,495
1964	2,122	11,090	105	2,696	481	16,494
1965	1,696	59,086	257	1,173	501	62,712
1966	665	48,943	48	1,077	152	50,886
1967	3,753	79,172	1,650	2,038	724	87,337
1968	3,252	200,069	3,438	4,104	1,759	212,622
1969	4,930	191,231	16,013	3,519	2,493	218,185
1970	19,106	132,270	15,222	2,572	2	169,172
1971	2,310	66,313	28,840	12,909	-	110,372
1972	23,908	124,695	54,788	4,600	1,121	209,113
1973	85,488	93,761	21,236	2,833	-	203,288
1974	62,710	62,876	18,952	5,154	-	149,693
1975	30,722	206,314	12,048	6,896	-	255,480

* Years 1959, 1960 and 1961 record non-basic expenditure in both consortium as well as NIOC accounts. To rectify double-counting the following items have been deducted from NIOC accounts for relevant years: $506, $5,583 and $2,827 respectively.

Totals may not add up due to rounding.

Table 22.
Gross Fixed Investment; NIOC
Constant 1969 US (000) Dollars

Year	Buildings	Construction	Machinery & Equipment	Transportation	Miscellaneous	Total
1957	-	-	-	-	-	24,059
1958	-	-	-	-	-	27,476
1959	-	-	-	-	-	39,300
1960	-	-	-	-	-	56,559
1961	-	-	-	-	-	21,457
1962	-	-	-	-	-	11,192
1963	-	-	-	-	-	21,055*
1964	2,686	13,421	174	2,758	648	19,688
1965	2,145	69,439	437	1,153	667	73,840
1966	844	55,795	70	1,049	189	57,947
1967	4,556	88,490	2,327	2,172	878	98,423
1968	3,953	211,176	4,076	4,093	1,938	225,237
1969	4,930	191,231	16,013	3,519	2,493	218,185
1970	18,894	128,853	13,832	2,419	2	163,100
1971	2,283	59,996	23,934	10,191	-	96,403
1972	22,168	100,723	46,165	3,315	920	173,291
1973	66,113	64,547	14,211	2,301	-	147,173
1974	42,692	38,090	10,482	3,714	-	94,979
1975	18,668	111,594	5,374	4,115	-	139,750

* Investments in years 1957 through 1963 are deflated by General Index.

Totals may not add up due to rounding.

Table 23.

Gross Fixed Investment in Oil Industry (Consortium + NIOC): Current US (000) Dollars

Year	CONSORTIUM Producing (1)	CONSORTIUM Refining (2)	NATIONAL IRANIAN OIL CO. Producing (3)	NATIONAL IRANIAN OIL CO. Refining (4)	Total Consortium Companies (1)+(2)=(5)	Total NIOC (3)+(4)=(6)	Total Producing (1)+(3)=(7)	Total Refining (2)+(4)=(8)	Grand Total (7)+(8)=(9)
1955	4,200	1,960	--	--	6,160	--	4,200	1,960	6,160
1956	12,040	3,631	--	--	15,671	--	12,040	3,631	15,671
1957	32,483	10,636	15,537	347	43,119	15,884	48,020	10,983	59,001
1958	70,621	10,644	16,147	2,323	81,265	18,470	86,767	12,967	99,734
1959	70,693	7,391	22,703	5,125	78,084	27,828	93,903	12,516	105,912
1960	47,713	11,135	38,163	2,441	58,848	40,603	91,460	13,575	99,451
1961	38,923	16,532	15,748	277	55,455	16,024	57,497	16,809	71,479
1962	43,897	16,679	7,820	213	60,549	8,032	51,716	16,892	68,608
1963	42,228	10,429	15,410	85	52,656	15,495	57,638	10,514	68,152
1964	39,625	4,820	16,091	403	44,445	16,494	55,715	5,223	60,938
1965	91,128	11,872	4,761	57,951	103,000	62,712	95,889	69,823	165,712
1966	39,529	29,629	2,511	48,375	69,158	50,886	42,040	78,004	120,044
1967	43,887	15,212	86,908	429	59,094	87,337	130,795	15,641	146,436
1968	59,018	9,987	199,517	13,105	69,005	212,622	258,535	23,092	281,627
1969	82,338	15,196	207,722	10,462	97,534	218,185	290,060	25,659	315,719
1970	53,670	33,411	155,779	13,939	57,081	169,172	209,449	16,804	226,253
1971	108,432	1,971	83,860	26,512	110,404	110,372	192,292	28,484	220,776
1972	108,296	5,357	136,754	72,359	113,654	209,113	245,050	77,716	322,767
1973	168,804	3,173	109,068	94,220	171,477	203,288	277,372	97,393	374,766
1974	305,105	13,710	52,731	96,962	318,815	149,693	357,836	110,673	468,508
1975	603,418	14,614	150,792	104,688	618,031	255,480	754,210	119,300	873,512

Totals may not add up due to rounding.

Table 24.

Gross Fixed Investment in Oil Industry (Consortium + NIOC):

Constant 1969 US (000) Dollars

Year	CONSORTIUM Producing (1)	Refining (2)	NATIONAL IRANIAN OIL CO. Producing (3)	Refining (4)	Total Consortium (1)+(2)=(5)	Total NIOC (3)+(4)=(6)	Total Producing (1)+(3)=(7)	Total Refining (2)+(4)=(8)	Grand Total (7)+(8)=(9)
1955	9,038	4,218	--	--	13,255	--	9,038	4,218	13,255
1956	18,260	5,506	--	--	23,767	--	18,260	5,506	23,767
1957	47,007	15,391	23,534	525	62,398	24,059	70,541	15,916	86,457
1958	102,549	15,457	24,021	3,456	118,006	27,476	126,570	18,912	145,482
1959	95,460	9,980	32,063	7,237	105,440	39,300	127,522	17,217	144,739
1960	63,873	14,906	53,159	3,400	78,779	56,559	117,032	18,306	135,338
1961	51,602	21,918	21,284	374	73,520	21,657	72,886	22,292	95,177
1962	60,547	22,968	10,895	296	83,515	11,192	71,441	23,264	94,707
1963	55,070	13,768	20,940	115	68,838	21,055	76,010	13,883	89,893
1964	50,927	6,231	19,207	481	57,458	19,688	70,134	6,712	76,846
1965	114,793	14,955	5,565	67,736	129,748	73,302	120,358	82,691	203,049
1966	50,785	38,066	2,860	55,087	88,851	57,947	53,645	93,153	146,798
1967	54,265	18,803	97,940	483	73,069	98,423	152,205	19,287	171,492
1968	65,680	11,114	211,354	13,882	76,795	225,237	277,035	24,997	302,032
1969	82,338	15,196	207,722	10,462	97,534	218,185	290,060	25,659	315,719
1970	51,157	3,251	151,783	13,049	54,409	164,832	202,940	16,301	219,241
1971	96,519	1,755	73,247	23,157	98,275	96,403	169,766	24,912	194,678
1972	88,903	4,399	113,327	59,964	93,301	173,291	202,230	64,362	266,593
1973	115,745	2,183	78,961	66,212	117,927	145,172	194,706	68,395	263,100
1974	182,997	8,224	33,457	61,521	191,220	94,979	216,454	69,745	286,199
1975	314,094	7,607	82,485	57,267	321,700	139,751	396,578	64,873	461,451

Totals may not add up due to rounding.

Table 25.

Capital Stock; Buildings: Residential and Non-residential. Foreign sector (Consortium)
(Dollars in thousands) $r = 1/60$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_n = r\,[2I_0 + \sum_{t=n} (\sum_{t=1} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\Sigma_0^t I_t \cdot I}{St}$
1954	28,452	28,452	35,947	35,947	0	35,947	30.00
1955	1,261	29,713	1,556	37,504	1,211	38,292	29.75
1956	3,209	32,923	- 3,772	41,276	1,256	38,809	28.00
1957	10,644	43,567	12,751	54,026	1,395	50,164	22.35
1958	15,994	59,560	19,346	73,373	1,661	67,850	17.25
1959	14,805	74,365	17,796	91,169	1,970	83,676	14.80
1960	7,969	82,334	9,271	100,441	2,196	90,752	14.40
1961	7,197	90,303	8,682	109,123	2,345	97,088	14.20
1962	8,605	98,907	11,100	120,221	2,510	105,677	13.85
1963	5,241	104,148	7,014	127,235	2,661	110,030	14.00
1964	3,371	107,520	4,268	131,503	2,755	111,542	14.60
1965	2,328	109,846	2,943	134,446	2,815	111,670	15.25
1966	2,258	112,105	2,865	137,311	2,864	111,671	16.15
1967	2,514	114,619	3,052	140,363	2,913	111,860	16.55
1968	1,127	115,747	1,370	141,733	2,950	110,230	17.50
1969	714	116,461	714	142,447	2,967	107,977	18.30
1970	575	117,036	568	143,016	2,978	105,568	19.25
1971	760	117,795	751	143,766	2,989	103,329	20.15
1972	1,093	118,889	1,014	144,780	3,004	101,340	21.00
1973	1,465	119,354	1,133	145,914	3,022	99,451	21.80
1974	6,292	125,646	4,284	150,197	3,067	100,668	22.20
1975	13,689	139,336	8,321	158,528	3,172	105,817	22.00

Figures may not add up due to rounding.

Table 26.

Capital Stock; Buildings: Producing; Foreign Sector (Consortium)

(Dollars in thousands) r = 1/60

Year	Annual Invest. (I) Current US $	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I-8$	Depreciation $D_n = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $Y = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1954	11,855	11,855	14,978	14,978	-	14,978	30
1955	860	12,715	1,061	16,039	508	17,531	29
1956	2,464	15,179	2,897	18,936	541	17,887	25.50
1957	4,391	19,570	5,260	24,196	611	22,535	20.80
1958	10,663	30,233	12,898	37,093	760	34,673	14.40
1959	11,807	42,040	14,190	51,283	986	47,876	11.30
1960	5,227	47,266	6,080	57,363	1,155	52,802	11.00
1961	3,695	51,733	4,457	61,821	1,243	56,016	11.20
1962	3,019	54,752	3,895	65,714	1,312	58,600	11.50
1963	1,889	56,641	2,528	68,243	1,366	59,762	12.10
1964	2,614	59,255	3,309	71,552	1,414	61,657	12.48
1965	2,117	61,372	2,676	74,228	1,464	62,868	13.05
1966	1,730	63,102	2,195	76,422	1,505	63,558	13.65
1967	1,839	64,941	2,232	78,655	1,542	64,249	14.25
1968	834	65,775	1,014	79,668	1,569	63,694	15.05
1969	434	66,209	434	80,103	1,581	62,547	15.90
1970	218	66,427	215	80,318	1,586	61,176	16.90
1971	462	66,889	456	80,775	1,592	60,042	17.80
1972	692	67,580	641	81,416	1,601	59,082	18.65
1973	610	67,190	471	81,887	1,610	57,943	19.55
1974	5,762	72,952	3,922	85,810	1,647	60,218	19.65
1975	13,297	86,249	8,082	93,902	1,747	66,554	18.90

Totals may not add up due to rounding.

Table 26.
Capital Stock; Buildings: Refining; Foreign Sector (Consortium)
(Dollars in thousands) $r = 1/60$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I-0$	Depreciation $D_n = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $Y = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1954	16,597	16,597	20,969	20,969	0	20,969	30
1955	401	16,998	495	21,464	703	20,761	30.30
1956	745	17,743	876	22,340	715	20,922	30.10
1957	6,253	23,997	7,491	29,831	784	27,629	23.40
1958	5,331	29,328	6,449	36,280	900	33,177	20.15
1959	2,998	32,326	3,607	39,886	984	35,800	19.30
1960	2,742	35,068	3,191	43,077	1,041	37,950	18.80
1961	3,502	38,570	4,224	47,302	1,103	41,071	18.10
1962	5,585	44,155	7,205	54,507	1,198	47,078	16.65
1963	3,352	47,507	4,486	58,993	1,296	50,268	16.35
1964	757	48,264	958	59,951	1,341	49,886	17.10
1965	211	48,476	267	60,218	1,351	48,802	18.00
1966	528	49,004	670	60,889	1,359	48,113	18.80
1967	675	49,679	820	61,708	1,371	47,561	19.50
1968	293	49,972	356	62,064	1,381	46,536	20.40
1969	280	50,252	280	62,344	1,386	45,430	21.30
1970	357	50,609	353	62,697	1,392	44,391	22.20
1971	298	50,907	294	62,992	1,397	43,288	23.10
1972	402	51,309	373	63,364	1,403	42,258	23.95
1973	855	52,164	662	64,027	1,411	41,502	24.70
1974	531	52,695	361	64,388	1,420	40,450	25.55
1975	392	53,087	239	64,626	1,425	39,264	26.45

Totals may not add up due to rounding.

Table 27.

Capital Stock; Building: NIOC

(Dollars in thousands) $r = 1/60$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I - \theta$	Depreciation $D_n = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $Y = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1956	1,680	1,680	1,975	1,975	0	1,975	30
1957	1,906	3,586	2,887	4,862	90	4,772	12.92
1958	2,216	5,802	3,297	8,159	141	7,928	8.50
1959	3,339	9,142	4,716	12,875	208	12,435	6.20
1960	4,872	14,014	6,787	19,662	304	18,918	4.90
1961	1,923	15,937	2,599	22,261	382	21,135	5.25
1962	964	16,901	1,343	23,604	415	22,063	5.90
1963	1,859	18,760	2,527	26,130	447	24,142	6.30
1964	2,122	20,882	2,686	28,816	491	26,337	6.68
1965	1,696	22,579	2,145	30,961	531	27,951	7.16
1966	665	23,244	844	31,805	556	28,239	7.95
1967	3,753	26,997	4,556	36,361	601	32,194	7.91
1968	3,252	30,249	3,953	40,314	672	35,475	8.07
1969	4,930	35,179	4,930	45,244	746	39,660	8.34
1970	24,036	54,285	18,894	64,138	945	57,609	9.50
1971	26,345	56,594	2,283	66,421	1,121	58,771	9.75
1972	23,908	80,502	22,168	88,589	1,328	79,611	7.45
1973	85,458	165,601	66,113	154,702	2,066	143,658	5.10
1974	62,710	228,670	42,607	197,394	2,973	183,377	4.92
1975	30,712	259,383	18,668	216,062	3,484	198,561	5.42

Totals may not add up due to rounding.

Table 27.

Capital Stock; Buildings: Production; NIOC

(Dollars in thousands) $r = 1/60$

Year	Annual Invest. (I) Current US \$	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US \$	Gross Stock $S_t = \sum_{t=0}^{t=n} I - \theta$	Depreciation $D_n = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L_i . I}{St}$
1956	470	470	553	553	0	553	30
1957	534	1,004	808	1,361	25	1,336	13
1958	621	1,625	923	2,284	40	2,220	8.50
1959	935	2,560	1,320	3,605	58	3,482	6.20
1960	1,364	3,924	1,900	5,505	85	5,297	4.90
1961	538	4,462	728	6,233	107	5,918	5.25
1962	270	4,732	376	6,609	116	6,178	5.90
1963	521	5,253	707	7,317	125	6,760	6.30
1964	2,122	7,375	2,686	10,002	154	9,292	5.50
1965	1,696	9,071	2,145	12,147	194	11,243	5.40
1966	665	9,737	844	12,991	219	11,869	6.00
1967	3,753	13,490	4,556	17,547	264	16,161	5.35
1968	3,252	16,742	3,953	21,501	335	19,779	5.25
1969	4,913	21,654	4,913	26,413	408	24,284	5.20
1970	6,587	28,241	6,514	32,927	504	30,294	5.00
1971	2,114	30,355	2,089	35,016	575	31,808	5.80
1972	(376)	29,979	(348)	34,668	593	30,866	6.45
1973	2,740	32,719	2,120	36,788	610	32,376	7.40
1974	10,408	43,127	7,086	43,873	687	38,774	7.10
1975	26,701	69,829	16,230	60,103	881	54,122	6.00

Totals may not add up due to rounding.

Table 29.
Capital Stock; Buildings: Refining; NIOC
(Dollars in thousands) r = 1/60

Year	Annual Invest. (I) Current US $	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_n = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1956	1,210	1,210	1,422	1,422	0	1,422	30
1957	1,372	2,582	2,079	3,500	65	3,436	12.90
1958	1,596	4,178	2,374	5,874	102	5,708	8.50
1959	2,404	6,582	3,396	9,270	150	8,953	6.20
1960	3,508	10,090	4,887	14,157	219	13,621	4.90
1961	1,385	11,475	1,871	16,028	275	15,217	5.25
1962	694	12,169	967	16,995	299	15,885	5.90
1963	1,339	13,507	1,819	18,814	322	17,382	6.30
1964	-	13,507	-	18,814	337	17,045	7.30
1965	-	13,507	-	18,814	337	16,708	8.30
1966	-	13,507	-	18,814	337	16,371	9.30
1967	-	13,507	-	18,814	337	16,033	10.30
1968	-	13,507	-	18,814	337	15,696	11.30
1969	17	13,525	17	18,831	337	15,376	11.28
1970	12,519	26,043	12,380	31,211	441	27,315	8.50
1971	196	26,239	194	31,405	546	26,963	8.45
1972	24,284	50,523	22,516	53,921	735	48,745	8.10
1973	82,718	133,241	63,993	117,914	1,456	111,282	4.40
1974	52,302	185,543	35,606	153,521	2,286	144,603	4.30
1975	4,011	189,554	2,438	155,959	2,603	144,439	5.20

Totals may not add up due to rounding

Table 30.

Capital Stock; Construction: Oil and Non-Oil; Foreign Sector (Consortium)

(Dollars in Thousands) $r = 1/30$

Year	Annual Invest. (I) Current US \$	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US \$	Gross Stock $S_t = \sum_{t=0}^{t=n} I - \theta$	Depreciation $D_n = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\Sigma_o^t L.I}{St}$
1954	79,904	79,904	129,023	129,023	0	129,023	15.00
1955	2,745	82,643	4,222	133,245	8,672	124,573	15.50
1956	6,985	89,633	10,079	143,324	8,910	125,742	15.40
1957	16,153	105,786	22,623	165,947	9,455	138,910	14.20
1958	33,780	129,566	45,953	211,900	10,598	174,264	12.10
1959	40,275	169,841	52,475	264,375	12,239	214,501	10.50
1960	28,765	198,606	37,479	301,854	13,738	238,242	10.20
1961	29, 39	227,945	37,965	339,819	14,995	261,211	10.00
1962	32,689	260,634	41,920	381,739	16,327	286,805	9.80
1963	38,323	298,957	47,748	429,487	17,821	316,732	9.70
1964	33,097	332,054	40,055	469,542	19,284	337,502	9.80
1965	84,010	416,064	98,731	568,272	21,598	414,635	9.00
1966	33,570	449,633	38,269	606,542	23,881	429,023	9.80
1967	31,861	481,495	35,611	642,153	25,112	439,522	9.90
1968	36,999	518,494	39,053	681,206	26,357	452,219	10.30
1969	58,867	577,361	58,867	740,073	27,989	483,097	10.30
1970	37,462	614,823	36,502	776,576	20,977	498,623	9.90
1971	87,617	702,441	79,270	855,846	22,908	554,985	7.10
1972	71,183	773,624	57,499	913,344	25,187	587,296	7.50
1973	143,172	916,796	98,563	1,011,907	27,788	658,071	7.60
1974	251,231	1,168,027	151,802	1,163,709	31,961	777,912	7.40
1975	440,477	1,608,504	238,250	1,401,959	38,462	977,700	7.00

Table 31.
Capital Stock; Construction: Producing, Foreign Sector (Consortium)
(Dollars in thousands) $r = 1/30$

Year	Annual Invest. (I) Current US \$	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US \$	Gross Stock $S_t = \sum_{t=0}^{t=n} I\text{-}\theta$	Depreciation $D_{t=n} = r[2I_0 + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $Y = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1954	69,946	69,946	112,943	112,943	0	112,943	15
1955	1,871	71,812	2,879	115,822	7,578	108,244	15.65
1956	5,363	77,180	7,739	123,561	7,754	108,229	15.60
1957	15,991	93,171	22,396	145,957	8,257	122,368	14.00
1958	33,041	116,212	44,947	190,904	9,379	157,936	11.65
1959	38,876	155,087	50,652	241,557	10,972	197,616	10.00
1960	27,421	182,509	35,728	277,285	12,412	220,932	9.75
1961	27,476	209,984	35,554	312,838	13,600	242,886	9.55
1962	30,906	240,890	39,633	352,471	14,853	267,665	9.40
1963	36,650	277,540	45,664	398,135	16,275	297,055	9.30
1964	31,212	308,752	37,773	435,908	17,665	317,162	9.40
1965	77,225	385,977	90,757	526,665	19,808	388,111	8.70
1966	22,745	408,722	25,929	552,594	21,752	392,288	9.70
1967	27,538	436,260	30,779	583,373	22,698	400,370	9.80
1968	36,143	472,403	38,150	621,523	23,846	414,674	10.15
1969	58,329	530,733	58,329	679,853	25,454	447,549	10.10
1970	36,990	567,723	36,042	731,975	19,498	464,093	10.10
1971	87,365	655,088	79,042	811,017	21,417	521,717	7.00
1972	67,820	722,907	54,782	865,798	23,648	552,851	7.45
1973	142,844	865,751	98,337	964,135	26,200	624,989	7.50
1974	240,450	1,106,201	145,270	1,109,405	30,260	739,999	7.30
1975	432,107	1,538,308	233,723	1,343,128	36,576	937,146	6.90

Table 32.
Capital Stock; Construction: Refining, Foreign Sector (Consortium)
(Dollars in thousands) $r = 1/30$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_{t=n} = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1954	9,958	9,958	16,080	16,080	0	16,080	15
1955	873	10,831	1,343	17,423	1,094	16,329	14.80
1956	1,622	12,453	2,340	19,763	1,156	17,513	14
1957	162	12,615	227	19,990	1,199	16,541	15.80
1958	739	13,354	1,006	20,996	1,219	16,328	16
1959	1,399	14,753	1,823	22,819	1,266	16,885	15.70
1960	1,344	16,097	1,751	24,567	1,326	17,310	15.55
1961	1,863	17,960	2,411	26,981	1,395	18,326	15.10
1962	1,784	19,744	2,287	29,268	1,473	19,139	14.90
1963	1,673	21,417	2,084	31,352	1,546	19,677	14.90
1964	1,885	23,302	2,282	33,633	1,619	20,340	14.80
1965	6,785	30,087	7,974	41,607	1,790	26,524	12.90
1966	10,825	40,912	12,340	53,947	2,129	36,735	10.83
1967	4,323	45,235	4,832	58,779	2,415	39,152	10.90
1968	856	46,091	903	59,683	2,510	37,545	11.75
1969	538	46,628	538	60,220	2,534	35,549	12.60
1970	472	47,101	460	44,601	1,479	34,530	6.75
1971	252	47,353	228	44,829	1,490	33,267	7.75
1972	3,364	50,717	2,717	47,546	1,540	34,445	8.25
1973	328	51,045	226	47,772	1,589	33,082	9.25
1974	10,782	61,826	6,531	54,304	1,701	37,913	9.05
1975	8,370	70,196	4,527	58,831	1,886	40,554	9.30

Table 33.
Capital Stock; Construction: NIOC
(Dollars in thousands) $r = 1/60$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_n = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1956	10,360	10,360	14,949	14,949	0	14,949	15.00
1957	11,754	22,114	17,804	31,753	1,293	31,460	7.83
1958	13,667	35,782	20,332	52,086	1,929	49,864	5.13
1959	20,593	56,374	29,082	81,168	2,568	76,377	4.09
1960	30,047	86,421	41,853	123,021	3,751	114,480	3.79
1961	11,858	98,279	16,027	139,048	4,715	125,791	4.33
1962	5,944	104,223	8,282	147,329	5,120	128,952	5.04
1963	11,466	115,689	15,581	162,910	5,518	139,015	5.53
1964	11,090	126,778	13,421	176,331	6,001	146,434	6.06
1965	59,086	185,864	69,439	245,770	7,382	208,491	5.20
1966	49,556	235,420	56,568	302,338	9,483	255,576	5.15
1967	79,172	314,592	88,490	390,828	11,900	332,166	4.86
1968	35,855	350,447	211,176	602,005	16,895	526,448	3.98
1969	191,231	541,677	191,231	793,235	23,601	694,077	3.93
1970	132,270	673,948	128,881	922,116	28,937	794,022	4.30
1971	66,313	740,261	59,996	982,112	32,085	821,933	5.00
1972	124,695	864,956	100,723	1,067,886	33,956	888,700	5.50
1973	93,761	958,718	64,547	1,132,433	36,710	916,537	6.15
1974	62,876	1,031,612	38,090	1,170,523	38,421	916,206	6.95
1975	206,314	1,227,925	111,594	1,282,117	40,916	986,884	7.28

Table 34.
Capital Stock; Construction: Producing, NIOC
(Dollars in thousands) $r = 1/30$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_n = r[2I_0 + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $Y = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1956	8,392	8,392	12,109	12,109	0	12,109	15.00
1957	9,521	17,912	14,421	26,530	1,048	25,482	7.60
1958	11,071	28,983	16,469	43,000	1,562	40,389	4.95
1959	16,680	45,663	23,556	66,556	2,230	61,716	4.00
1960	24,338	70,001	33,901	100,457	3,187	92,430	3.80
1961	9,605	79,606	12,981	113,439	3,969	101,443	4.35
1962	4,815	84,421	6,708	120,147	4,297	103,855	5.05
1963	9,287	93,708	12,621	132,767	4,619	111,856	5.55
1964	10,731	104,438	12,986	145,754	5,046	119,797	6.00
1965	1,372	105,810	1,612	147,366	5,289	116,120	6.90
1966	600	106,410	759	148,124	5,328	111,550	7.90
1967	79,172	185,582	88,490	236,615	6,816	193,225	5.75
1968	24,136	209,718	198,807	435,422	11,604	380,428	3.90
1969	182,195	391,913	182,195	617,617	17,954	544,668	3.60
1970	131,664	523,578	128,290	745,907	23,129	649,830	3.90
1971	65,606	589,184	59,356	805,263	26,256	682,929	4.55
1972	124,547	713,731	100,604	803,758	28,115	755,418	5.07
1973	93,682	807,413	64,492	958,250	30,867	789,043	5.70
1974	32,280	849,710	19,555	977,805	32,268	776,331	6.60
1975	114,497	954,207	61,931	1,039,736	33,626	804,636	7.15

Table 35.

Capital Stock; Construction: Refining; NIOC

(Dollars in thousands) $r = 1/30$

Year	Annual Invest. (I) Current US \$	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 Us \$	Gross Stock $S_t = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_n = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1956	1,968	1,968	2,840	2,840	0	2,840	15.00
1957	2,233	4,202	3,383	5,223	246	5,977	9.00
1958	2,597	6,799	3,863	9,086	367	9,474	6.00
1959	3,913	10,711	5,526	14,612	339	14,661	4.50
1960	5,709	16,420	7,952	22,564	563	22,050	3.75
1961	2,253	18,673	3,045	25,609	747	24,348	4.25
1962	1,129	19,802	1,574	27,183	824	25,098	5.00
1963	2,179	21,981	2,960	30,143	899	27,159	5.45
1964	359	22,340	435	30,577	956	26,638	6.35
1965	57,714	80,054	67,827	98,404	2,094	92,371	2.65
1966	48,956	129,010	55,809	154,213	4,154	144,026	2.50
1967	-	129,010	-	154,214	5,084	138,942	3.50
1968	11,719	140,728	12,369	166,583	5,290	146,021	4.20
1969	9,036	149,764	9,036	175,619	5,647	149,409	5.10
1970	606	150,370	591	176,209	5,808	144,192	6.00
1971	707	151,077	640	176,849	5,828	139,004	7.00
1972	148	151,225	119	174,128	5,841	133,282	7.63
1973	80	151,305	55	174,183	5,844	127,494	8.62
1974	30,596	181,901	18,535	192,718	6,154	139,875	8.75
1975	91,817	273,718	49,663	242,381	7,290	182,248	7.85

Table 36.
Capital Stock; Machinery: Foreign Sector (Consortium)
(Dollars in thousands) $r = 1/20$

Year	Annual Invest. (I) Current US \$	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US \$	Gross Stock $S_t = \sum_{t=0}^{t=n} I - 0$	Depreciation $D_{t=n} = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\Upsilon = \frac{\sum_{t=0}^{t=n} I_t I}{St}$
1954	37,699	37,699	158,002	158,002	0	158,002	10.00
1955	966	38,665	3,565	161,566	15,889	145,677	10.75
1956	2,459	41,124	4,847	166,414	16,100	134,425	11.45
1957	9,961	51,085	17,525	183,938	16,659	135,291	11.30
1958	13,114	64,199	23,931	207,869	17,695	141,526	10.95
1959	8,677	72,877	13,967	221,836	18,643	136,850	11.20
1960	6,864	79,741	10,814	232,650	19,262	128,402	11.70
1961	11,648	91,389	17,020	249,670	19,958	125,464	11.85
1962	11,978	103,366	19,476	269,145	20,870	124,069	12.05
1963	4,924	108,290	7,877	277,023	21,554	110,392	12.60
1964	3,815	112,106	6,330	283,352	21,909	94,811	13.30
1965	7,056	119,162	12,015	137,366	6,568	100,258	5.40
1966	26,734	145,895	39,130	176,496	7,847	131,542	5.10
1967	20,181	166,076	28,460	204,956	9,536	150,465	5.30
1968	25,079	191,156	29,732	234,688	10,991	169,206	5.60
1969	29,876	221,031	29,876	264,563	12,481	186,601	5.90
1970	10,613	231,644	9,644	274,207	13,469	182,775	6.70
1971	19,493	251,136	16,176	290,383	14,115	184,837	7.25
1972	36,536	287,673	30,786	321,169	15,289	200,333	7.60
1973	18,542	306,214	12,408	333,577	16,369	196,373	8.25
1974	49,580	355,795	27,421	360,998	17,364	206,430	8.60
1975	143,405	499,200	63,963	421,397	19,560	250,833	8.30

Table 37.

Capital Stock; Machinery: Producing, (Consortium)

(Dollars in Thousands) $r = 1/20$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I - \theta$	Depreciation $D_{t=n} = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1954	17,783	17,783	74,530	74,530	0	74,530	10.00
1955	659	18,441	2,430	76,960	7,514	69,446	10.65
1956	1,888	20,330	3,722	80,682	7,668	65,501	11.20
1957	8,224	28,553	14,468	95,150	8,122	71,847	10.35
1958	10,981	39,534	20,036	115,187	8,985	82,898	9.50
1959	7,269	46,803	11,700	126,886	9,778	84,819	9.50
1960	3,190	49,993	5,026	131,912	10,196	79,649	10.20
1961	4,210	54,204	6,152	138,064	10,476	75,325	10.70
1962	7,696	61,900	12,514	150,579	10,943	76,897	10.95
1963	2,306	64,206	3,690	154,268	11,348	69,239	10.55
1964	3,030	67,237	5,028	159,296	11,566	62,700	12.15
1965	3,060	70,296	5,210	89,976	4,369	63,541	5.85
1966	10,227	80,523	14,969	104,945	4,873	73,636	6.00
1967	12,377	92,900	17,454	122,399	5,684	85,407	6.00
1968	17,248	110,148	20,449	142,848	6,631	99,224	6.15
1969	17,152	127,300	17,152	159,999	7,571	108,805	6.40
1970	9,730	137,030	884	168,841	8,221	109,425	7.05
1971	19,285	156,314	16,004	184,845	8,842	116,587	7.35
1972	36,275	192,589	30,565	215,410	10,006	137,145	7.40
1973	17,822	210,412	11,927	227,337	11,069	138,003	7.90
1974	48,684	259,095	26,925	254,262	12,040	152,889	8.05
1975	141,103	400,198	62,936	314,768	14,226	201,599	7.40

Table 38.
Capital Stock; Machinery: Refining, (Consortium)
(Dollars in Thousands) r = 1/20

Year	Annual Invest. (I) Current US $	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_{t=n} = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1954	19,916	19,916	83,472	83,472	0	83,472	10.00
1955	307	20,224	1,134	84,606	8,376	76,231	10.85
1956	571	20,795	1,125	85,731	8,432	68,924	11.70
1957	1,737	22,532	3,057	88,788	8,537	63,444	12.30
1958	2,133	24,665	3,894	92,683	8,710	58,628	12.05
1959	1,409	26,074	2,267	94,950	8,864	52,031	13.45
1960	3,674	29,748	5,788	100,738	9,066	48,753	13.65
1961	7,438	37,185	10,868	111,605	9,482	50,139	13.25
1962	4,281	41,466	6,961	118,567	9,928	47,172	13.45
1963	2,618	44,084	4,188	122,754	10,207	41,153	15.20
1964	785	44,869	1,302	124,057	10,344	32,112	14.75
1965	3,996	48,865	6,805	47,389	2,199	36,717	4.50
1966	16,507	65,373	24,161	71,551	2,973	57,905	3.80
1967	7,804	73,177	11,006	82,557	3,853	65,058	4.25
1968	7,831	81,008	9,284	91,840	4,360	69,982	4.75
1969	12,724	93,731	12,724	104,564	4,910	77,796	5.10
1970	883	94,614	802	105,366	5,248	73,350	6.10
1971	208	94,822	172	105,539	5,273	68,250	7.10
1972	261	95,083	220	105,759	5,282	63,188	8.05
1973	720	95,803	482	106,241	5,300	58,370	9.00
1974	897	96,700	496	106,736	5,324	53,541	9.95
1975	2,302	99,002	1,027	106,629	5,334	49,234	10.95

Table 39.

Capital Stock; Machinery, NIOC

(Dollars in Thousands) $r = 1/20$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_n = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1956	1,478	1,478	2,914	2,914	0	2,914	10.00
1957	1,677	3,156	2,704	5,618	359	5,259	5.93
1958	1,951	5,106	2,901	8,520	499	7,661	4.75
1959	2,939	8,045	4,150	12,670	676	11,136	4.02
1960	4,288	12,333	5,973	18,642	929	16,189	3.57
1961	1,692	14,025	2,287	20,929	1,135	17,332	4.13
1962	848	14,873	1,182	22,111	1,222	17,291	4.88
1963	1,636	16,509	2,223	24,335	1,307	18,208	4.90
1964	-	16,509	-	24,335	1,363	16,845	5.90
1965	230	16,739	391	24,726	1,372	15,864	6.80
1966	25	16,764	37	24,762	1,383	14,517	7.77
1967	1,637	18,401	2,308	24,156	1,442	15,384	7.95
1968	3,169	21,570	3,757	27,914	1,593	17,548	7.84
1969	15,917	37,487	15,917	43,830	2,085	31,380	5.81
1970	15,055	52,542	13,681	57,511	2,825	42,235	5.33
1971	28,705	81,247	23,822	81,333	3,762	62,294	4.61
1972	54,068	135,315	45,557	126,890	5,497	102,355	3.78
1973	18,483	153,798	12,369	139,259	6,945	107,779	4.40
1974	17,868	171,666	9,882	149,142	7,501	110,160	5.06
1975	3,550	175,216	1,583	150,725	7,788	103,955	5.65

Table 40.

Capital Stock: Machinery: Producing, NIOC

(Dollars in thousands) r = 1/20

Year	Annual Invest. (I) Current US $	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I\text{-}\theta$	Depreciation $D_n = r[2I_o + (\sum_{t=1}^{t=n} I) - I_n/2]$	Net stock	Age Index $Y = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1956	678	678	1,336	1,336	0	1,336	10.00
1957	769	1,446	1,164	2,500	163	2,337	6.10
1958	894	2,340	1,330	3,830	225	3,442	4.80
1959	1,347	3,687	1,902	5,732	306	5,038	4.05
1960	1,965	5,652	2,737	8,470	422	7,354	3.55
1961	776	6,428	1,048	9,518	517	7,885	4.10
1962	389	6,817	542	10,059	556	7,871	4.85
1963	750	7,567	1,019	11,079	595	8,294	5.35
1964	-	7,567	-	11,079	621	7,673	6.35
1965	228	7,795	389	11,467	631	7,431	7.15
1966	25	7,820	37	11,507	641	6,827	8.10
1967	1,303	9,122	1,837	12,005	688	7,976	7.90
1968	2,016	11,139	2,390	14,395	794	9,572	7.50
1969	14,716	25,854	14,716	29,111	1,221	23,067	4.45
1970	4,181	30,036	3,799	32,910	1,684	25,182	4.90
1971	3,234	33,270	2,684	35,594	1,846	26,020	5.45
1972	7,878	41,147	6,638	42,232	2,079	30,578	5.55
1973	9,936	51,083	6,649	48,881	2,411	34,816	5.70
1974	5,027	56,111	2,780	51,662	2,647	34,949	6.30
1975	1,876	57,986	837	52,498	2,738	33,048	6.20

Figures may not add up due to rounding.

Table 41.

Capital Stock; Machinery: Refining, NIOC.

(Dollars in thousands) $r = 1/20$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_n' = r[2I_0 + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\Upsilon = \frac{\sum_{t=0}^{t=n} I_i.i.}{St}$
1956	801	801	1,579	1,579	0	1,579	10
1957	909	1,709	1,540	3,118	196	2,922	5.80
1958	1,057	2,766	1,572	4,690	274	4,219	4.70
1959	1,592	4,358	2,248	6,938	370	6,098	4.00
1960	2,323	6,680	3,235	10,173	507	8,826	3.60
1961	917	7,597	1,239	11,412	619	9,446	4.15
1962	459	8,056	640	12,052	666	9,421	4.90
1963	886	8,943	1,204	13,256	712	9,914	4.50
1964	-	8,943	-	13,256	742	9,172	5.50
1965	1	8,944	2	13,259	742	8,433	6.49
1966	-	8,944	-	13,259	742	7,691	7.49
1967	334	9,278	471	12,151	754	7,408	8.00
1968	1,153	10,432	1,367	13,519	800	7,976	8.20
1969	1,201	11,632	1,201	14,719	864	8,313	8.50
1970	10,874	22,507	9,881	24,601	1,141	17,053	5.90
1971	25,471	47,978	21,138	45,738	1,916	36,275	3.95
1972	46,190	94,168	38,920	84,658	3,418	71,777	2.90
1973	8,547	102,715	5,720	90,378	4,534	72,963	3.70
1974	12,841	115,556	7,102	97,480	4,854	75,210	4.40
1975	1,674	117,230	747	98,227	5,051	70,907	5.35

Table 42.

Capital Stock; Equipment, Foreign Sector (Consortium)

(Dollars in Thousands) $r = 1/5$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_{t=n} = \sum_{t=0}^{t=n} I - \theta$	Depreciation $D_{t=n} = r[2I_0 + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L_t I}{St}$
1954	23,947	23,947	100,366	100,366	0	100,366	2.50
1955	662	24,609	2,443	102,809	40,391	62,418	3.45
1956	1,685	26,295	3,322	106,132	40,967	24,774	4.30
1957	2,611	28,906	4,593	10,359	21,686	7,681	1.30
1958	10,552	39,458	19,256	29,615	3,997	22,940	1.15
1959	8,601	48,059	13,843	43,450	7,307	29,476	1.60
1960	5,156	53,215	8,124	49,139	9,260	28,339	2.10
1961	4,349	57,563	6,354	52,170	10,131	24,562	2.65
1962	4,990	62,553	8,114	55,691	10,786	21,890	3.90
1963	3,078	65,631	4,924	41,358	9,705	17,109	2.95
1964	3,571	69,203	5,926	33,441	7,480	15,555	2.70
1965	9,553	78,756	12,266	37,583	7,102	20,719	2.25
1966	4,452	83,207	6,516	37,745	7,533	19,702	2.10
1967	3,141	86,848	4,429	34,060	7,181	16,950	2.50
1968	4,320	90,668	5,121	34,258	6,832	15,240	2.65
1969	6,608	97,275	6,608	34,940	6,920	14,927	2.85
1970	7,483	104,758	6,799	29,473	6,441	15,286	2.95
1971	1,431	106,189	1,188	24,145	5,362	11,111	2.70
1972	3,864	110,053	3,255	22,972	4,712	9,655	2.90
1973	6,040	115,093	4,042	21,892	4,486	9,210	2.90
1974	3,814	119,907	2,109	17,394	3,929	7,391	2.90
1975	5,217	125,124	2,327	12,921	3,032	6,687	2.45

Table 43.

Capital Stock; Equipment: Production, Foreign Sector (Consortium)

(Dollars in Thousands) $r = 1/5$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_{t=n} = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_{t=n} = r[2I_0 + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1954	10,670	10,670	44,718	44,718	0	44,718	2.50
1955	451	11,121	1,666	46,384	18,054	28,330	3.45
1956	1,294	12,415	2,551	48,935	18,475	12,406	4.20
1957	810	13,225	1,425	5,642	9,929	3,901	1.55
1958	9,162	22,387	16,718	22,360	2,800	17,819	1.05
1959	7,648	30,035	12,310	34,670	5,703	24,426	1.25
1960	2,683	32,719	4,228	37,232	7,190	21,464	2.10
1961	1,088	33,806	1,590	36,271	7,350	15,703	2.85
1962	938	34,745	1,526	36,372	7,264	9,965	4.85
1963	859	35,604	1,374	21,028	5,740	5,599	3.65
1964	2,364	37,968	3,923	12,641	3,367	6,155	2.60
1965	8,339	46,308	10,200	18,612	3,125	13,230	1.50
1966	3,484	49,791	5,099	22,122	4,073	14,255	1.30
1967	1,065	50,856	1,502	22,098	4,422	11,335	2.40
1968	3,845	54,702	4,559	25,282	4,738	11,156	2.60
1969	5,786	60,487	5,786	27,145	5,243	11,699	2.80
1970	6,414	66,902	5,829	22,774	4,992	12,536	2.95
1971	733	67,635	608	18,284	4,106	9,038	2.50
1972	3,128	70,763	2,636	19,417	3,770	7,904	2.95
1973	5,424	76,187	3,630	18,488	3,793	7,741	2.90
1974	2,988	79,175	1,652	14,355	3,284	6,109	2.90
1975	4,112	83,287	1,834	10,360	2,472	5,472	2.40

Table 44.

Capital Stock; Equipment: Refining, Foreign Sector (Consortium)

(Dollars in Thousands) $r = 1/5$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_{t=n} = \sum_{t=0}^{t=n} I - \theta$	Depreciation $D_{t=n} = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} I_i \cdot I}{St}$
1954	13,278	13,278	55,648	55,648	0	55,648	2.50
1955	211	13,488	777	56,425	22,337	34,088	3.45
1956	391	13,880	771	57,197	22,492	12,368	4.40
1957	1,801	15,681	3,168	4,717	11,756	3,780	1.00
1958	1,391	17,071	2,538	7,255	1,197	5,121	1.45
1959	952	18,024	1,533	8,788	1,604	5,049	3.00
1960	2,473	20,496	3,896	11,906	2,069	6,876	2.10
1961	3,261	23,757	4,764	15,899	2,781	8,859	2.20
1962	4,052	27,809	6,588	19,319	3,522	11,926	2.10
1963	2,219	30,027	3,549	20,330	3,965	11,510	2.25
1964	1,207	31,234	2,003	20,800	4,113	9,400	2.75
1965	1,214	32,448	2,067	18,971	3,977	7,489	3.00
1966	968	33,416	1,417	15,624	3,460	5,447	3.25
1967	2,075	35,492	2,927	11,962	2,759	5,615	2.65
1968	475	35,966	563	8,976	2,094	4,084	2.75
1969	822	36,788	822	7,795	1,677	3,229	2.95
1970	1,068	37,856	971	6,699	1,450	2,750	2.95
1971	698	38,555	579	5,862	1,256	2,073	3.25
1972	735	39,290	620	3,554	942	1,751	2.53
1973	616	39,906	412	3,404	694	1,469	2.90
1974	826	40,732	457	3,039	644	1,282	2.95
1975	1,105	41,837	493	2,561	560	1,215	2.75

Table 45.
Capital Stock; Equipment, NIOC
(Dollars in thousands) $r = 1/5$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_r = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_r = \sum_{t=0}^{t=n} I^{\pm 0}$	Depreciation $D_n = r[2I_0 + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1956	62	62	121	121	0	121	2.50
1957	70	131	110	232	60	172	2.06
1958	81	213	123	355	81	214	2.18
1959	122	335	173	406	88	299	1.34
1960	179	514	249	653	106	442	1.65
1961	71	584	95	750	141	496	2.38
1962	35	620	49	689	144	302	2.83
1963	68	688	93	658	135	260	3.05
1964	105	793	174	660	258	177	2.73
1965	27	820	46	457	111	111	2.25
1966	23	842	33	394	85	59	2.69
1967	13	856	19	464	76	(50)	2.58
1968	269	1,124	319	590	95	174	2.06
1969	96	1,221	96	511	110	159	1.75
1970	167	1,388	152	618	113	198	2.00
1971	135	1,522	112	696	132	178	2.47
1972	721	2,243	607	1,285	198	587	2.05
1973	2,753	4,996	1,842	2,808	409	2,020	1.09
1974	1,084	6,080	599	3,312	612	2,007	1.70
1975	8,498	14,575	3,790	6,950	1,026	4,771	1.46

Table 46.

Capital Stock; Equipment: Producing, NfOC

(Dollars in thousands) $r = 1/5$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_n = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1956	15	15	30	30	0	30	2.50
1957	17	33	26	57	15	42	2.07
1958	20	53	32	89	21	54	2.15
1959	31	84	43	102	22	75	1.30
1960	45	128	62	162	27	110	1.65
1961	18	146	24	188	35	99	2.35
1962	9	155	12	174	36	75	2.80
1963	17	172	23	165	34	64	3.05
1964	105	277	174	296	46	193	1.73
1965	27	304	46	279	57	181	1.76
1966	23	326	33	289	57	157	2.25
1967	13	340	19	395	58	118	2.25
1968	190	530	226	498	79	264	2.35
1969	96	626	96	419	92	269	1.80
1970	82	709	75	448	87	257	2.15
1971	120	829	100	515	96	260	2.48
1972	398	1,227	335	832	135	461	2.25
1973	87	1,314	58	664	150	369	2.20
1974	129	1,443	71	639	130	310	2.60
1975	1,582	3,025	706	1,270	191	825	1.75

Table 47.

Capital Stock; Equipment: Refining, NIOC

(Dollars in thousands) $r = 1/5$

Year	Annual Invest. (I) Current US \$	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US \$	Gross Stock $S_t = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_n = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} t.I}{St}$
1956	46	46	91	91	0	91	2.50
1957	52	99	84	175	45	130	2.06
1958	61	160	91	266	60	161	2.20
1959	92	251	130	304	66	224	1.35
1960	134	385	187	491	80	331	1.65
1961	53	438	71	562	105	397	2.40
1962	27	465	37	515	108	227	2.85
1963	51	516	69	494	101	195	3.05
1964	-	516	-	364	212	(16)	3.55
1965	-	516	-	177	54	(70)	3.05
1966	-	516	-	106	28	(99)	3.85
1967	-	516	-	69	18	(167)	4.50
1968	78	594	93	92	16	(91)	0.50
1969	-	594	-	92	19	(109)	1.50
1970	85	679	77	169	26	(59)	1.60
1971	15	694	12	181	35	(82)	2.45
1972	323	1,016	272	453	64	127	1.70
1973	2,666	3,682	1,784	2,144	260	1,651	0.75
1974	955	4,637	528	2,672	482	1,697	1.50
1975	6,916	11,550	3,085	5,680	835	3,946	1.40

Table 48.

Capital Stock; Transportation, Foreign Sector (Consortium)

(Dollars in thousands) $r = 1/20$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_{t=n} = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_{t=n} = r[2I_o + (\sum_{t=0}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1954	9,247	9,247	24,528	24,528	0	24,528	10.00
1955	335	9,582	1,087	25,615	2,480	23,135	10.55
1956	841	10,423	959	26,575	2,531	21,563	10.75
1957	2,588	13,012	3,147	29,721	2,634	22,076	10.55
1958	4,577	17,589	4,688	34,410	2,830	23,935	10.00
1959	3,794	21,383	4,630	39,039	3,063	25,502	9.80
1960	6,429	27,812	7,985	47,025	3,378	30,110	9.20
1961	2,464	30,276	2,881	49,905	3,650	29,341	9.50
1962	1,943	32,220	2,389	52,294	3,781	27,948	10.05
1963	686	32,908	726	53,021	3,859	24,815	10.90
1964	660	33,568	676	53,696	3,894	21,597	11.75
1965	799	34,367	786	29,954	1,478	20,904	5.85
1966	2,207	36,574	2,148	32,102	1,551	21,501	6.40
1967	1,203	37,777	1,282	33,384	1,637	21,145	7.10
1968	1,076	38,853	1,073	34,457	1,696	20,522	7.85
1969	967	39,820	967	35,424	1,747	19,742	8.70
1970	538	40,358	506	35,929	1,784	18,464	9.50
1971	880	41,238	695	36,624	1,814	17,345	10.25
1972	537	41,775	387	37,012	1,841	15,891	10.95
1973	1,967	43,742	1,598	38,609	1,891	15,598	11.60
1974	7,255	50,998	5,228	43,837	2,061	18,766	11.25
1975	8,425	59,423	5,420	48,170	2,300	21,885	10.75

Table 49.

Capital Stock; Transportation, Producing, Foreign Sector (Consortium)

(Dollars in thousands) $r = 1/20$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_{t=n} = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_{t=n} = r[2I_0 + (\sum_{t=0}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1954	5,928	5,928	15,723	15,723	0	15,723	10.00
1955	229	6,157	346	16,069	1,581	14,488	10.75
1956	644	6,801	216	16,285	1,595	13,109	11.65
1957	2,359	9,160	279	16,563	1,607	11,780	12.40
1958	4,093	13,253	496	17,059	1,627	10,649	12.90
1959	3,464	16,717	403	17,462	1,649	9,403	13.70
1960	5,749	22,466	857	18,319	1,681	8,579	14.30
1961	2,273	24,739	253	18,572	1,708	7,124	14.80
1962	1,245	25,984	858	19,430	1,736	6,246	15.15
1963	388	26,372	317	19,748	1,766	4,797	15.90
1964	293	26,665	376	20,123	1,784	3,389	16.65
1965	270	26,935	520	4,920	237	3,672	5.00
1966	1,216	28,152	964	5,884	277	4,359	5.05
1967	1,031	29,183	183	6,067	306	4,237	5.80
1968	768	29,950	307	6,375	318	4,226	6.65
1969	476	30,427	491	6,865	338	4,379	7.70
1970	43	30,470	465	7,331	362	4,483	6.60
1971	528	30,998	278	7,608	380	4,380	8.35
1972	93	31,091	320	7,928	395	4,305	8.30
1973	1,250	32,341	583	8,511	418	4,470	9.25
1974	6,730	39,071	379	8,890	442	4,408	10.35
1975	6,131	45,201	1,475	10,020	479	5,404	12.00

Table 50.
Capital Stock; Transportation: Refining, Foreign Sector (Consortium)
(Dollars in thousands) $r = 1/20$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_{t=n} = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_{t=n} = r[2I_o + (\sum_{t=0}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $Y = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1954	3,319	3,319	8,805	8,805	0	8,805	10.00
1955	106	3,426	741	9,546	899	8,647	10.20
1956	197	3,623	744	10,290	936	8,455	10.40
1957	229	3,852	2,868	13,158	1,026	10,296	9.00
1958	484	4,336	4,193	17,350	1,203	13,286	7.75
1959	330	4,666	4,227	21,577	1,413	16,099	7.10
1960	680	5,346	7,128	28,705	1,697	21,530	6.25
1961	191	5,537	2,628	31,333	1,941	22,217	6.65
1962	698	6,235	1,530	32,864	2,045	21,702	7.35
1963	300	6,536	409	33,273	2,094	20,018	8.25
1964	367	6,903	300	33,573	2,111	18,207	9.15
1965	529	7,432	266	25,034	1,241	17,232	6.25
1966	990	8,422	1,184	26,218	1,275	17,141	6.95
1967	172	8,594	1,099	27,317	1,332	16,909	7.65
1968	308	8,902	765	28,082	1,378	16,296	8.40
1969	491	9,393	476	28,558	1,409	15,363	9.25
1970	495	9,888	41	28,599	1,422	13,981	10.25
1971	352	10,240	417	29,016	1,434	12,965	11.10
1972	444	10,684	67	29,083	1,446	11,586	12.05
1973	718	11,401	1,015	30,098	1,473	11,128	12.65
1974	526	11,927	4,849	34,947	1,619	14,358	11.80
1975	2,294	14,221	3,945	38,151	1,821	16,482	10.70

Table 51.
Capital Stock; Transportation, NIOC
(Dollars in thousands) $r = 1/20$

Year	Annual Invest. (I) Current US \$	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US \$	Gross Stock $S_t = \sum_{t=0}^{t=n} I - \theta$	Depreciation $D_n = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $Y = \frac{\sum_{t=0}^{t=n} I_i \cdot I}{St}$
1956	420	420	479	479	0	479	10.00
1957	477	897	722	1,201	66	1,135	4.69
1958	554	1,451	1,426	2,025	105	1,855	3.59
1959	835	2,285	2,241	3,204	155	2,879	3.09
1960	1,218	3,504	1,697	4,901	227	4,349	2.85
1961	481	3,984	650	5,551	285	4,714	3.45
1962	4,066	4,225	336	5,887	310	4,740	4.20
1963	4,531	4,690	632	6,518	334	5,037	4.75
1964	2,969	7,386	2,758	9,277	419	7,377	4.18
1965	1,173	8,558	1,153	10,430	517	8,013	4.67
1966	1,077	9,636	1,049	11,478	572	8,490	5.19
1967	2,038	11,674	2,172	13,171	652	10,010	5.48
1968	4,104	15,778	4,093	17,264	809	13,296	4.96
1969	3,519	19,297	3,519	20,783	998	15,817	5.04
1970	2,572	21,869	2,419	23,201	1,146	17,089	5.45
1971	33,925	34,778	10,191	33,392	1,462	25,819	4.64
1972	4,600	39,378	3,315	36,708	1,799	27,335	5.17
1973	2,833	42,211	2,301	39,008	1,740	27,696	5.85
1974	5,154	47,369	3,714	42,723	2,090	29,320	6.29
1975	6,396	53,762	4,115	46,838	2,290	31,145	6.69

Table 52.
Capital Stock; Producing: Transportation, NIOC
(Dollars in thousands) $r = 1/20$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_n = r[2I_0 + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1956	403	403	460	460	0	460	10.00
1957	457	861	693	1,153	63	1,090	4.70
1958	532	1,393	791	1,944	100	1,781	3.60
1959	801	2,194	1,132	3,076	149	2,764	3.10
1960	1,169	3,363	1,629	4,705	218	4,175	2.85
1961	461	3,825	624	5,329	274	4,525	3.45
1962	231	4,056	322	5,651	298	4,550	4.20
1963	446	4,502	606	6,258	321	4,836	4.75
1964	2,652	7,154	2,713	8,971	404	7,145	4.15
1965	1,129	8,283	1,110	10,081	499	7,756	4.65
1966	959	9,242	933	11,014	550	8,139	5.20
1967	1,944	11,185	2,071	12,625	625	9,585	5.50
1968	4,024	15,209	4,012	16,637	776	12,821	4.95
1969	3,310	18,519	3,310	19,947	959	15,171	5.05
1970	2,497	21,016	2,348	22,295	1,101	16,419	5.45
1971	12,785	33,801	10,093	32,389	1,412	25,100	4.60
1972	4,307	38,108	3,104	35,493	1,742	26,462	5.15
1973	2,624	40,732	2,131	37,623	1,873	26,720	5.85
1974	4,887	45,619	3,521	41,145	2,014	28,228	6.30
1975	6,136	51,754	3,948	45,093	2,205	29,970	6.70

Table 53.
Capital Stock; Refining: Transportation; NIOC
(Dollars in thousands) $r = 1/20$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_n = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $Y = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1956	17	17	19	19	0	19	10.00
1957	19	36	29	48	3	45	4.65
1958	22	58	33	81	4	74	3.55
1959	33	91	47	128	6	115	3.06
1960	49	140	68	196	9	174	2.85
1961	19	159	26	222	11	189	3.45
1962	10	169	13	235	12	190	4.20
1963	19	188	25	261	13	201	4.75
1964	44	232	45	306	15	231	5.00
1965	44	276	43	349	17	257	5.30
1966	119	394	116	465	21	352	4.85
1967	94	489	101	546	27	426	5.10
1968	81	570	81	627	31	475	5.35
1969	209	778	209	835	38	645	4.90
1970	75	853	71	906	45	670	5.50
1971	124	977	98	1,004	50	718	5.90
1972	293	1,270	211	1,215	57	872	5.80
1973	209	1,480	170	1,385	67	975	6.00
1974	268	1,747	193	1,578	76	1,092	6.20
1975	260	2,008	167	1,745	85	1,175	6.55

Table 54.
Capital Stock; Miscellaneous, Foreign Sector (Consortium)
(Dollars in thousands) $r = 1/3$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_{t=n} = \sum_{t=0}^{t=n} I - \theta$	Depreciation $D_{t=n} = r[2I_0 + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1954	5,690	5,690	11,975	11,975	0	11,975	1.50
1955	193	5,883	381	12,356	8,047	4,309	2.45
1956	491	6,374	786	1,167	4,250	846	0.85
1957	1,162	7,536	1,760	2,927	682	1,923	0.95
1958	3,247	10,783	4,831	7,377	1,717	5,037	0.95
1959	1,932	12,716	2,729	9,319	2,783	4,983	2.15
1960	3,665	16,381	5,105	12,665	3,664	6,424	1.50
1961	458	16,839	619	8,453	3,520	3,523	1.75
1962	371	17,210	517	6,242	2,449	1,591	1.65
1963	403	17,613	548	1,684	1,321	819	1.55
1964	(71)	17,542	(96)	970	458	265	1.95
1965	(746)	16,796	(993)	(540)	269	(997)	2.50
1966	(62)	16,735	(77)	(1,165)	91	(1,165)	0.00
1967	193	16,928	235	(1,082)	39	(969)	0.50
1968	404	17,332	445	(755)	152	(677)	0.85
1969	503	17,834	503	(412)	310	(485)	1.85
1970	410	18,245	389	(258)	420	(515)	1.50
1971	223	18,468	195	(567)	404	(724)	1.80
1972	439	18,907	360	(650)	339	(702)	1.55
1973	269	19,175	183	(855)	281	(800)	1.50
1974	642	19,817	376	(675)	276	(700)	1.50
1975	6,818	26,635	3,418	(2,383)	816	1,902	0.70

Table 55.

Capital Stock; Miscellaneous: Producing, Foreign Sector (Consortium)

(Dollars in thousands) $r = 1/3$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_{t=n} = \sum_{t=0}^{t=n} I - \theta$	Depreciation $D_{t=n} = r[2I_0 + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1954	2,371	2,371	4,990	4,990	0	4,990	1.50
1955	132	2,503	260	5,250	3,370	1,880	2.40
1956	377	2,880	604	864	2,050	433	0.80
1957	709	3,588	1,073	1,937	467	1,040	1.10
1958	2,682	6,271	3,991	5,668	1,267	3,763	1.25
1959	1,631	7,901	2,301	7,365	2,172	3,892	1.35
1960	3,443	11,345	4,796	11,088	3,076	5,613	1.45
1961	180	11,525	244	7,342	3,072	2,785	1.80
1962	92	11,618	129	5,169	2,085	829	2.40
1963	136	11,753	184	557	954	59	1.60
1964	113	11,865	152	465	145	66	1.45
1965	89	11,954	118	455	83	101	1.65
1966	128	12,082	159	429	31	229	1.50
1967	31	12,113	38	315	6	261	1.75
1968	179	12,292	197	395	45	413	1.40
1969	160	12,452	160	395	105	468	1.20
1970	266	12,718	252	610	168	553	1.40
1971	59	12,778	52	405	179	425	1.75
1972	288	13,066	237	541	168	494	1.55
1973	125	13,191	85	374	152	427	1.40
1974	492	13,684	288	610	164	551	1.65
1975	6,668	20,352	3,343	3,717	721	3,173	0.60

Table 56.

Capital Stock; Miscellaneous: Refining, Foreign Sector (Consortium)

(Dollars in thousands) $r = 1/3$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_{t=n} = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_{t=n} = \sum_{t=0}^{t=n} I - \theta$	Depreciation $D_{t=n} = r[2I_0 + (\sum_{t=0}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $Y = \frac{\sum_{t=0}^{t=n} i \cdot I}{St}$
1954	3,319	3,319	6,985	6,985	0	6,985	1.50
1955	61	3,381	121	7,107	4,677	2,430	2.45
1956	114	3,495	182	304	2,199	413	0.90
1957	453	3,948	686	990	216	883	0.93
1958	565	4,513	840	1,709	450	1,274	1.10
1959	303	4,815	427	1,954	610	1,091	1.65
1960	222	5,037	309	1,577	588	811	1.85
1961	278	5,315	375	1,112	448	738	1.55
1962	279	5,593	388	1,072	364	763	1.95
1963	268	5,861	364	1,128	367	760	1.50
1964	(184)	5,677	(248)	505	313	199	2.00
1965	(835)	4,842	(1,111)	(995)	186	(1,098)	2.50
1966	(189)	4,653	(235)	(1,594)	61	(1,394)	0.00
1967	162	4,815	197	(1,397)	33	(1,230)	0.50
1968	224	5,040	247	(1,148)	107	(1,090)	0.95
1969	342	5,382	342	(807)	205	(952)	1.30
1970	144	5,526	137	(868)	252	(1,068)	1.65
1971	164	5,690	143	(972)	225	(1,149)	1.80
1972	151	5,841	124	(1,191)	171	(1,197)	1.55
1973	143	5,984	98	(1,229)	128	(1,227)	1.62
1974	149	6,134	88	(1,285)	112	(1,251)	1.60
1975	150	6,283	75	(1,334)	95	(1,271)	1.60

Table 57.
Capital Stock; Miscellaneous, NIOC
(Dollars in thousands) $r = 1/3$.

Year	Annual Invest. (I) Current US $	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I - \theta$	Depreciation $D_n = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} 1..I}{St}$
1956							
1957							
1958							
1959							
1960							
1961							
1962							
1963							
1964	481	481	648	648	108	540	0.50
1965	501	982	667	1,315	471	736	0.98
1966	152	1,135	189	1,504	726	199	1.79
1967	724	1,858	878	1,734	1,281	(205)	1.34
1968	1,759	3,617	1,938	3,006	1,666	68	0.89
1969	2,493	6,110	2,493	5,309	4,184	(1,623)	1.16
1970	2	6,112	2	4,432	2,991	(4,613)	1.88
1971	-	6,112	-	3,473	676	(5,289)	2.50
1972	1,121	7,233	920	1,469	1,025	(5,393)	0.50
1973	-	-	-	920	307	(5,700)	1.50
1974	-	-	-	920	307	153	2.50
1975	-	-	-	-	153	0	0.00

Table 58.

Capital Stock; Producing: Miscellaneous, NIOC

(Dollars in thousands) $r = 1/3$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I - \theta$	Depreciation $D_n = r[2I_0 + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $\gamma = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1956							
1957							
1958							
1959							
1960							
1961							
1962							
1963							
1964	481	481	648	648	108	540	0.50
1965	309	791	412	1,060	429	523	1.10
1966	152	943	189	1,249	641	71	1.85
1967	724	1,667	878	1,479	1,196	(247)	1.20
1968	1,685	3,352	1,857	2,924	1,609	(0)	0.95
1969	2,493	5,844	2,493	5,227	4,157	(1,664)	1.20
1970	2	5,846	2	4,351	2,964	(4,626)	1.95
1971	-	-	-	3,473	662	(5,289)	2.50
1972	-	-	-	549	872	(6,160)	0.00
1973	-	-	-	-	-	(6,161)	-
1974							
1975							

Table 59.
Capital Stock; Refining: Miscellaneous, NIOC
(Dollars in thousands) $r = 1/3$

Year	Annual Invest. (I) Current US $	Nominal Stock $S_t = \sum_{t=0}^{t=n} I$	Annual Invest. (I) Constant 1969 US $	Gross Stock $S_t = \sum_{t=0}^{t=n} I-\theta$	Depreciation $D_n = r[2I_o + (\sum_{t=1}^{t=n} I) - \frac{I_n}{2}]$	Net Stock	Age Index $Y = \frac{\sum_{t=0}^{t=n} L.I}{St}$
1956							
1957							
1958							
1959							
1960							
1961							
1962							
1963							
1964							
1965	192	192	255	255	42	212	0.50
1966	-	192	-	255	85	127	1.50
1967	-	192	-	255	85	42	2.50
1968	74	266	82	82	56	68	0.50
1969	-	266	-	82	27	41	1.50
1970	-	266	-	82	27	14	2.50
1971	-	266	-	0	14	0	0.00
1972	1,121	1,387	920	920	153	767	0.50
1973	-	1,387	-	920	307	460	1.50
1974	-	1,387	-	920	307	153	2.50
1975	-	1,387	-	0	153	0	0.00

Table 60.

Nominal Stock: Accumulated Investment, Foreign Sector (Consortium)

Current Prices in 000 US Dollars $S_t = S_o^{t-1} + I = \Sigma_o^n I$

Year	Buildings	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1954	28,452	79,904	37,699	23,947	9,247	5,690	184,940
1955	29,713	82,643	38,665	24,609	9,582	5,883	191,097
1956	32,923	89,633	41,124	26,295	10,423	6,374	206,773
1957	43,567	105,786	51,085	28,906	13,012	7,536	249,891
1958	59,560	129,566	64,199	39,458	17,589	10,783	321,156
1959	74,365	169,841	72,877	48,059	21,383	12,717	399,242
1960	82,334	198,606	79,741	53,215	27,812	16,381	458,089
1961	90,303	227,945	91,389	57,563	30,276	16,839	514,315
1962	98,907	260,634	103,366	62,553	32,220	17,210	574,891
1963	104,148	298,957	108,290	65,631	32,908	17,613	627,548
1964	107,520	332,054	112,106	69,203	33,568	17,542	671,993
1965	109,847	416,064	119,162	78,756	34,367	16,796	774,993
1966	112,105	449,633	145,895	83,207	36,574	16,735	844,151
1967	114,619	481,495	166,076	86,348	37,777	16,928	903,244
1968	115,747	518,494	191,156	90,668	38,853	17,332	972,249
1969	116,461	577,361	221,031	97,275	39,820	17,834	1,069,783
1970	117,036	614,823	231,644	104,758	40,358	18,245	1,126,864
1971	117,795	702,441	251,136	106,189	41,238	18,468	1,237,267
1972	118,889	773,624	287,673	110,053	41,775	18,907	1,350,920
1973	119,354	916,796	306,214	116,093	43,742	19,175	1,521,375
1974	125,646	1,168,027	355,795	119,907	50,998	19,817	1,840,190
1975	139,336	1,608,504	499,200	125,124	59,423	26,635	2,458,221

Totals may not add up due to rounding.

Table 62.

Nominal Stock: Accumulated Investment, Refining (Consortium)

Current prices in US 000 Dollars

Year	Buildings	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1954	16,597	9,958	19,916	13,278	3,319	3,319	66,388
1955	16,998	10,831	20,224	13,488	3,425	3,381	68,348
1956	17,743	12,453	20,795	13,880	3,623	3,495	71,988
1957	23,997	12,615	22,532	15,681	3,852	3,948	82,624
1958	29,328	13,354	24,665	17,071	4,336	4,513	93,267
1959	32,326	14,753	26,074	18,024	4,666	4,815	100,658
1960	35,068	16,097	29,748	20,496	5,346	5,037	111,792
1961	38,570	17,960	37,185	23,757	5,537	5,315	128,324
1962	44,155	19,744	41,466	27,809	6,235	5,593	145,003
1963	47,507	21,417	44,084	30,027	6,536	5,861	155,432
1964	48,264	23,302	44,869	31,234	6,903	5,677	160,250
1965	48,476	30,087	48,865	32,448	7,432	4,842	172,151
1966	49,004	40,912	65,373	33,416	8,422	4,653	201,779
1967	49,679	45,235	73,177	35,492	8,594	4,815	216,992
1968	49,972	46,091	81,008	35,966	8,902	5,040	226,979
1969	50,252	46,628	93,731	36,788	9,393	5,382	242,175
1970	50,609	47,101	94,614	37,856	9,888	5,526	245,594
1971	50,907	47,353	94,822	38,555	10,240	5,690	247,566
1972	51,309	50,717	95,083	39,290	10,684	5,841	252,923
1973	52,164	51,045	95,803	39,906	11,401	5,984	256,303
1974	52,695	61,826	96,700	40,732	11,927	6,134	270,013
1975	53,087	70,196	99,002	41,837	14,221	6,283	284,627

Totals may not add up due to rounding.

Table 63.

Nominal Stock: Accumulated Investment Total NIOC

Current Prices in US 000 Dollars

Year	Buildings	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1956	1,680	10,360	1,478	62	420	-	14,000
1957	3,586	22,114	3,156	131	897	-	29,884
1958	5,802	35,782	5,106	213	1,451	-	48,354
1959	9,142	56,374	8,045	335	2,285	-	76,182
1960	14,014	86,421	12,333	514	3,504	-	116,785
1961	15,937	98,279	14,025	584	3,984	-	132,810
1962	16,901	104,223	14,873	620	4,225	-	140,842
1963	18,760	115,689	16,509	688	4,690	-	156,336
1964	20,882	126,778	16,509	793	7,386	481	172,830
1965	22,579	185,864	16,739	850	8,558	982	235,542
1966	23,244	235,420	16,764	842	9,636	1,135	287,041
1967	26,997	314,592	18,401	856	11,674	1,858	374,378
1968	30,249	350,447	21,570	1,124	15,778	3,617	422,786
1969	35,179	541,677	37,487	1,221	19,297	6,110	640,971
1970	54,285	673,948	52,542	1,388	21,869	6,112	810,143
1971	56,594	740,261	81,247	1,522	34,778	6,112	920,515
1972	80,502	864,956	135,315	2,243	39,378	7,233	1,129,628
1973	165,601	958,718	153,798	4,996	42,211	7,233	1,332,916
1974	228,670	1,031,612	171,666	6,080	47,366	7,233	1,492,627
1975	259,883	1,237,925	175,216	14,575	53,762	7,233	1,738,094

Totals may not add up due to rounding.

Table 64.

Nominal Stock: Accumulated Investmen Producing (NIOC)

Current Prices in US 000 Dollars

Year	Buildings	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1956	470	8,392	678	15	403	-	9,958
1957	1,004	17,912	1,446	33	861	-	21,256
1958	1,625	28,983	2,340	53	1,393	-	34,394
1959	2,560	45,663	3,687	84	2,194	-	54,188
1960	3,924	70,001	5,652	128	3,363	-	83,069
1961	4,462	79,606	6,428	146	3,825	-	94,467
1962	4,732	84,421	6,817	155	4,056	-	100,181
1963	5,253	93,708	7,567	172	4,502	-	111,202
1964	7,375	104,438	7,567	277	7,154	481	127,293
1965	9,071	105,810	7,795	304	8,283	791	132,054
1966	9,737	106,410	7,820	326	9,242	943	134,478
1967	13,490	185,582	9,122	340	11,185	1,667	221,386
1968	16,742	209,718	11,139	530	15,209	3,352	256,689
1969	21,654	391,913	25,854	626	18,519	5,844	464,411
1970	28,241	523,578	30,036	709	21,016	5,846	609,425
1971	30,355	589,184	33,270	829	33,801	5,846	693,284
1972	29,979	713,731	41,147	1,227	38,108	5,846	830,038
1973	32,719	807,413	51,083	1,314	40,732	5,846	939,106
1974	43,127	849,710	56,111	1,443	45,619	5,846	1,001,855
1975	69,829	954,207	57,986	3,025	51,754	5,846	1,142,647

Totals may not add up due to rounding.

Table 65.

Nominal Stock: Accumulated Investment Refining (NIOC)

Current Prices in US 000 Dollars

Year	Buildings	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1956	1,210	1,968	801	46	17	-	4,042
1957	2,582	4,202	1,709	99	36	-	8,628
1958	4,178	6,799	2,766	160	58	-	13,960
1959	6,582	10,711	4,358	251	91	-	21,994
1960	10,090	16,420	6,680	385	140	-	33,716
1961	11,475	18,673	7,597	438	159	-	38,342
1962	12,169	19,802	8,056	465	169	-	40,661
1963	13,507	21,981	8,943	516	188	-	45,135
1964	13,507	22,340	8,943	516	232	-	45,537
1965	13,507	80,054	8,944	516	276	192	103,488
1966	13,507	129,010	8,944	516	394	192	152,563
1967	13,507	129,010	9,278	516	489	192	152,992
1968	13,507	140,728	10,432	594	570	266	166,097
1969	13,525	149,764	11,632	594	778	266	176,559
1970	26,043	150,370	22,507	679	853	266	200,718
1971	26,239	151,077	47,978	494	977	266	227,231
1972	50,523	151,225	94,168	1,016	1,270	1,387	299,590
1973	133,241	151,305	102,715	3,682	1,480	1,387	393,809
1974	185,543	181,901	115,556	4,637	1,747	1,387	490,772
1975	189,554	273,718	117,230	11,550	2,008	1,387	595,447

Totals may not add up due to rounding.

Table 66.
Gross Stock; Constant 1969 US Dollars: Foreign Sector (Consortium)
(Dollars in thousands) $S_t = S_o^{t-1} + I - \theta$

Year	Buildings	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1954	35,947	129,023	158,002	100,366	24,528	11,975	459,840
1955	37,504	133,245	161,566	102,809	25,615	12,356	473,096
1956	41,276	143,324	166,414	106,132	26,575	1,167	484,887
1957	54,026	165,947	183,938	10,359	29,721	2,927	446,919
1958	73,373	211,900	207,869	29,615	34,410	7,377	564,544
1959	91,169	264,375	221,836	43,458	39,039	9,319	669,197
1960	100,441	301,854	232,650	49,139	47,025	12,665	743,773
1961	109,122	339,819	249,670	52,170	49,905	8,453	809,140
1962	120,221	381,739	269,145	55,691	52,294	6,242	885,332
1963	127,235	429,487	277,023	41,358	53,021	1,684	929,808
1964	131,503	469,542	283,353	33,441	53,696	970	972,504
1965	134,446	568,272	137,366	37,583	29,954	(540)	907,082
1966	137,311	606,542	176,496	37,745	32,102	(1,165)	989,031
1967	140,363	642,153	204,956	34,060	33,384	(1,082)	1,053,834
1968	141,733	681,206	234,688	34,258	34,457	(755)	1,125,587
1969	142,447	740,073	264,563	34,940	35,424	(412)	1,217,035
1970	143,016	776,576	274,207	29,473	35,929	(258)	1,258,943
1971	143,766	855,896	290,383	24,145	36,624	(567)	1,350,197
1972	144,780	913,344	321,169	22,972	37,012	(650)	1,438,627
1973	145,914	1,011,907	333,577	21,892	38,609	(855)	1,551,044
1974	150,197	1,163,709	360,998	17,394	43,837	(675)	1,735,461
1975	158,528	1,401,959	421,397	12,921	48,170	2,383	2,045,359

Table 67.
Gross Stock; Constant 1969 US Dollars: Producing (Consortium)
(Dollars in thousands)

Year	Buildings	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1954	14,978	112,943	74,530	44,718	15,723	4,990	267,881
1955	16,039	115,822	76,960	46,384	16,069	5,250	276,524
1956	18,936	123,561	80,682	48,935	16,285	864	289,262
1957	24,196	145,957	95,150	5,642	16,563	1,937	289,445
1958	37,093	190,904	115,187	22,360	17,059	5,668	388,271
1959	51,283	241,557	126,886	34,670	17,462	7,365	479,224
1960	57,363	277,285	131,912	37,232	18,319	11,088	533,200
1961	61,821	312,838	138,064	36,271	18,572	7,342	574,908
1962	65,714	352,471	150,579	36,371	19,430	5,169	629,736
1963	68,243	398,135	154,268	21,028	19,748	557	661,978
1964	71,552	435,908	159,296	12,641	20,123	465	699,985
1965	74,228	526,665	89,976	18,612	4,920	455	714,856
1966	76,422	552,594	104,945	22,122	5,884	429	762,397
1967	78,655	583,373	122,399	22,098	6,067	315	812,907
1968	79,668	621,523	142,848	25,282	6,375	395	876,092
1969	80,103	679,853	159,999	27,145	6,865	395	954,361
1970	80,318	731,975	168,841	22,774	7,331	610	1,011,848
1971	80,775	811,017	184,845	18,284	7,608	405	1,102,932
1972	81,416	865,798	215,407	19,417	7,928	541	1,190,511
1973	81,887	964,135	227,337	18,488	8,511	374	1,300,732
1974	85,810	1,109,405	254,262	14,355	8,890	610	1,473,332
1975	93,902	1,343,128	314,768	10,360	10,010	3,717	1,775,895

Table 68.
Gross Stock; Constant 1969 US Dollars: Refining (Consortium)
(Dollars in thousands)

Year	Building	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1954	20,969	16,080	83,472	55,648	8,805	6,985	191,959
1955	21,464	17,423	84,606	56,425	9,546	7,107	196,572
1956	22,340	19,763	85,731	57,197	10,290	304	195,625
1957	29,831	19,990	88,788	4,717	13,158	990	157,474
1958	36,280	20,996	92,683	7,255	17,350	1,709	176,273
1959	39,886	22,819	94,950	8,788	21,577	1,954	189,974
1960	43,077	24,570	100,738	11,906	28,705	1,577	210,573
1961	47,302	26,981	111,605	15,899	31,333	1,112	234,232
1962	54,507	29,268	118,567	19,319	32,864	1,072	255,796
1963	58,993	31,352	122,754	20,330	33,273	1,128	267,830
1964	59,951	33,633	124,057	20,800	33,573	505	272,519
1965	60,218	41,607	47,389	18,971	25,034	(995)	192,226
1966	60,889	53,947	71,551	15,624	26,218	(1,594)	226,634
1967	61,708	58,779	82,557	11,963	27,317	(1,397)	240,926
1968	62,064	59,683	91,840	8,976	28,082	(1,150)	249,496
1969	62,344	60,220	104,564	7,795	28,558	(807)	262,675
1970	62,697	44,601	105,366	6,699	28,599	(868)	247,095
1971	62,992	44,829	105,539	5,862	29,016	(972)	247,265
1972	63,364	47,546	105,759	3,554	29,083	(1,191)	248,116
1973	64,027	47,772	106,241	3,404	30,098	(1,229)	250,311
1974	64,388	54,304	106,736	3,039	34,947	(1,285)	262,129
1975	64,626	58,831	106,629	2,561	38,151	(1,334)	269,464

Table 69.
Gross Stock; Constant 1969 US Dollars: NIOC
(Dollars in thousands)

Year	Building	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1956	1,975	14,949	2,914	121	470	-	20,430
1957	4,862	31,753	5,618	232	1,201	-	43,666
1958	8,159	52,086	8,520	355	2,025	-	71,145
1959	12,875	81,168	12,670	406	3,204	-	110,323
1960	19,662	123,021	18,642	653	4,901	-	166,880
1961	22,261	139,048	20,929	750	5,551	-	188,539
1962	23,604	147,329	22,111	689	5,887	-	199,620
1963	26,130	162,910	24,335	658	6,518	-	220,552
1964	28,816	176,331	24,335	660	9,277	648	240,067
1965	30,961	245,770	24,726	457	10,430	1,315	313,658
1966	31,805	302,338	24,762	394	11,478	1,504	372,283
1967	36,361	390,828	24,156	464	13,171	1,734	466,715
1968	40,314	602,005	27,914	590	17,264	3,006	691,092
1969	45,244	793,235	43,830	511	20,783	5,309	908,913
1970	64,138	922,116	57,511	618	23,201	4,432	1,072,017
1971	66,421	982,112	81,333	696	33,392	3,473	1,167,427
1972	88,589	1,067,886	126,890	1,285	36,708	1,469	1,322,826
1973	154,702	1,132,433	139,259	2,808	39,008	920	1,469,131
1974	197,394	1,170,523	149,142	3,312	42,723	920	1,564,013
1975	216,062	1,282,117	150,725	6,950	46,838	0	1,702,692

Table 70.
Gross Stock; Constant 1969 US Dollars: Producing, NIOC
(Dollars in thousands)

Year	Buildings	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1956	553	12,109	1,336	30	460	-	14,488
1957	1,361	26,530	2,500	57	1,153	-	31,602
1958	2,284	43,000	3,830	89	1,944	-	51,147
1959	3,605	66,556	5,732	102	3,076	-	79,071
1960	5,505	100,457	8,470	162	4,705	-	119,299
1961	6,233	113,439	9,518	188	5,329	-	134,706
1962	6,609	120,147	10,059	174	5,651	-	142,640
1963	7,317	132,767	11,078	165	6,258	-	157,585
1964	10,002	145,754	11,079	296	8,971	648	176,750
1965	12,147	147,366	11,467	279	10,081	1,060	182,400
1966	12,991	148,124	11,504	289	11,014	1,249	185,171
1967	17,547	236,615	12,005	395	12,625	1,479	280,666
1968	21,500	435,422	14,395	498	16,637	2,924	491,376
1969	26,413	617,617	29,111	419	19,947	5,227	698,735
1970	32,927	745,907	32,910	448	22,295	4,351	838,839
1971	35,016	805,263	35,594	515	32,389	3,473	912,250
1972	34,668	893,758	42,232	832	35,493	549	1,007,531
1973	36,788	958,250	48,881	664	37,623	0	1,082,206
1974	43,873	977,805	51,662	639	41,145	0	1,115,124
1975	60,103	1,039,736	52,498	1,270	45,093	0	1,198,700

Table 71.
Gross Stock; Constant 1969 US Dollars: Refining, NIOC
(Dollars in thousands)

Year	Buildings	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1956	1,422	2,840	1,579	91	19	-	5,951
1957	3,500	5,223	3,118	175	48	-	12,065
1958	5,874	9,086	4,690	266	81	-	19,997
1959	9,270	14,612	6,938	304	128	-	31,252
1960	14,157	22,564	10,173	491	196	-	47,580
1961	16,028	25,609	11,412	562	222	-	53,833
1962	16,995	27,183	12,052	515	235	-	56,979
1963	18,814	30,143	13,256	494	261	-	62,967
1964	18,814	30,577	13,256	364	306	-	63,317
1965	18,814	98,404	13,259	177	349	255	131,258
1966	18,814	154,213	13,259	106	465	255	187,111
1967	18,814	154,214	12,151	69	546	255	186,049
1968	18,814	166,583	13,519	92	627	82	199,716
1969	18,831	175,619	14,719	92	835	82	210,178
1970	31,211	176,209	24,601	169	906	82	233,178
1971	31,405	176,849	45,738	181	1,004	0	255,177
1972	53,921	174,128	84,658	453	1,215	920	315,296
1973	117,914	174,183	90,378	2,144	1,385	920	386,925
1974	153,521	192,718	97,480	2,672	1,578	920	448,890
1975	155,959	242,381	98,227	5,680	1,745	0	503,992

Table 72.
Depreciation; Constant 1969 US Dollars: Foreign Sector (Consortium)
(Dollars in thousands)

Year	Buildings r = 1/60	Construction r = 1/30	Machinery r = 1/20	Equipment r = 1/5	Transportation r = 1/20	Miscellaneous r = 1/3	Total
1954	0	0	0	0	0	0	0
1955	1,211	8,672	15,889	40,391	2,480	8,047	76,690
1956	1,256	8,910	16,100	40,967	2,531	4,250	74,014
1957	1,395	9,455	16,659	21,686	2,634	682	52,511
1958	1,661	10,598	17,695	3,997	2,830	1,717	38,499
1959	1,970	12,239	18,643	7,307	3,063	2,783	46,004
1960	2,196	13,738	19,262	9,260	3,378	3,664	51,498
1961	2,345	14,995	19,958	10,131	3,650	3,520	54,599
1962	2,510	16,327	20,870	10,786	3,781	2,449	56,724
1963	2,661	17,821	21,554	9,705	3,859	1,321	56,922
1964	2,755	19,284	21,909	7,480	3,894	458	55,782
1965	2,815	21,598	6,568	7,102	1,478	269	39,830
1966	2,864	23,881	7,847	7,533	1,551	91	43,767
1967	2,913	25,112	9,536	7,181	1,637	39	46,418
1968	2,950	26,357	10,991	6,832	1,696	152	48,978
1969	2,967	27,989	12,481	6,920	1,747	310	52,414
1970	2,978	20,977	13,469	6,441	1,784	420	46,069
1971	2,989	22,908	14,115	5,362	1,814	404	47,591
1972	3,004	25,187	15,289	4,712	1,841	339	50,371
1973	3,022	27,788	16,369	4,486	1,891	281	53,836
1974	3,067	31,961	17,364	3,929	2,061	276	58,658
1975	3,172	38,462	19,560	3,032	2,300	816	67,341

Table 73.
Depreciation; Production, Consortium
(Dollars in thousands)

Year	Buildings r = 1/60	Construction r = 1/30	Machinery r = 1/20	Equipment r = 1/5	Transportation r = 1/20	Miscellaneous r = 1/3	Total
1954	0	0	0	0	0	0	0
1955	508	7,578	7,514	18,054	1,581	3,370	38,604
1956	541	7,754	7,668	18,475	1,595	2,050	38,084
1957	611	8,257	8,122	9,929	1,607	467	28,994
1958	760	9,379	8,985	2,800	1,627	1,267	24,819
1959	986	10,972	9,778	5,703	1,649	2,172	31,261
1960	1,155	12,412	10,196	7,190	1,681	3,076	35,710
1961	1,243	13,600	10,476	7,350	1,708	3,072	37,449
1962	1,312	14,853	10,943	7,264	1,736	2,085	38,194
1963	1,365	16,275	11,348	5,740	1,766	954	37,448
1964	1,414	17,665	11,566	3,367	1,784	145	35,941
1965	1,464	19,808	4,369	3,125	237	83	29,086
1966	1,505	21,752	4,873	4,073	277	31	32,511
1967	1,542	22,698	5,684	4,422	306	6	34,657
1968	1,569	23,846	6,631	4,738	318	45	37,148
1969	1,581	25,454	7,571	5,243	338	105	40,292
1970	1,586	19,498	8,221	4,992	362	168	34,826
1971	1,592	21,417	8,842	4,106	380	179	36,517
1972	1,601	23,648	10,006	3,770	395	168	39,588
1973	1,610	26,200	11,069	3,793	418	152	43,242
1974	1,647	30,260	12,040	3,284	442	164	47,837
1975	1,747	36,576	14,226	2,472	479	721	56,221

Table 74.
Depreciation; Refining (Consortium)
(Dollars in thousands)

Year	Buildings r = 1/60	Construction r = 1/30	Machinery r = 1/20	Equipment r = 1/5	Transportation r = 1/20	Miscellaneous r = 1/3	Total
1954	0	0	0	0	0	0	0
1955	703	1,094	8,376	22,337	899	4,677	38,086
1956	715	1,156	8,432	22,492	936	2,199	35,930
1957	784	1,199	8,537	11,756	1,026	216	23,518
1958	900	1,219	8,710	1,197	1,203	450	13,680
1959	984	1,266	8,864	1,604	1,413	610	14,743
1960	1,041	1,326	9,066	2,069	1,697	588	15,788
1961	1,103	1,395	9,482	2,781	1,941	448	17,150
1962	1,198	1,473	9,928	3,522	2,045	364	18,530
1963	1,296	1,546	10,207	3,965	2,094	367	19,474
1964	1,341	1,619	10,343	4,113	2,111	313	19,840
1965	1,351	1,790	2,199	3,977	1,241	186	10,744
1966	1,359	2,129	2,973	3,460	1,275	61	11,256
1967	1,371	2,415	3,853	2,759	1,332	33	11,762
1968	1,381	2,510	4,360	2,094	1,378	107	11,830
1969	1,386	2,534	4,910	1,677	1,409	205	12,122
1970	1,392	1,479	5,248	1,450	1,422	252	11,243
1971	1,397	1,490	5,273	1,256	1,434	225	11,075
1972	1,403	1,540	5,282	942	1,446	171	10,783
1973	1,411	1,589	5,300	694	1,473	128	10,595
1974	1,420	1,701	5,324	644	1,619	112	10,821
1975	1,425	1,886	5,334	560	1,821	95	11,120

Table 75.
Depreciation; Constant 1969 US Dollars, NIOC
(Dollars in thousands)

$$D_n = r[2I_o + (\sum_{t=0}^{t=n} I) - I_n/2]$$

Year	Buildings	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
	r = 1/60	r = 1/30	r = 1/20	r = 1/5	r = 1/20	r = 1/3	
1956	0	0	0	0	0	-	0
1957	90	1,293	359	60	66	-	1,868
1958	141	1,929	499	81	105	-	2,755
1959	208	2,568	676	88	155	-	3,695
1960	304	3,751	929	106	227	-	5,316
1961	382	4,715	1,135	141	285	-	6,659
1962	415	5,120	1,222	144	310	-	7,211
1963	447	5,518	1,307	135	334	-	7,741
1964	491	6,001	1,363	258	419	108	8,639
1965	531	7,382	1,372	111	517	471	10,385
1966	556	9,483	1,383	85	572	726	12,805
1967	601	11,900	1,442	76	652	1,281	15,952
1968	672	16,895	1,593	95	808	1,666	21,729
1969	746	23,601	2,085	110	998	4,184	31,724
1970	945	28,937	2,825	113	1,146	2,991	36,957
1971	1,121	32,085	3,762	132	1,462	676	39,237
1972	1,328	33,956	5,497	198	1,799	1,025	43,803
1973	2,066	36,710	6,945	409	1,940	307	48,378
1974	2,973	38,421	7,501	612	2,090	307	51,904
1975	3,484	40,916	7,788	1,026	2,290	153	55,658

Table 76.
Depreciation; Constant 1969 US Dollars, Producing, NIOC
(Dollars in thousands)

$$D_n = r[2I_o + (\sum_{t=0}^{t=n} I) - I_n/2]$$

Year	Buildings r = 1/60	Construction r = 1/30	Machinery r = 1/20	Equipment r = 1/5	Transportation r = 1/20	Miscellaneous r = 1/3	Total
1956	0	0	0	0	0	-	0
1957	25	1,048	163	15	63	-	1,314
1958	40	1,562	225	21	100	-	1,948
1959	58	2,230	306	22	149	-	2,765
1960	85	3,187	422	27	218	-	3,938
1961	107	3,969	517	35	274	-	4,901
1962	116	4,297	556	36	298	-	5,303
1963	125	4,619	595	34	321	-	5,694
1964	154	5,046	621	46	404	108	6,378
1965	194	5,289	631	57	499	429	7,099
1966	219	5,328	641	57	550	641	7,437
1967	264	6,816	688	58	625	1,196	9,647
1968	335	11,604	794	79	776	1,609	15,198
1969	408	17,954	1,221	92	959	4,157	24,792
1970	504	23,129	1,684	87	1,101	2,964	29,468
1971	575	26,256	1,846	96	1,412	662	30,848
1972	593	28,115	2,079	135	1,742	872	33,535
1973	610	30,867	2,411	150	1,873	-	35,911
1974	687	32,268	2,647	130	2,014	-	37,746
1975	881	33,626	2,738	191	2,205	-	39,641

Table 77.
Depreciation; Constant 1969 US Dollars, Refining, NIOC
(Dollars in thousands)

$$D_n = r[2I_o + (\sum_{t=0}^{t=n} I) - I_n/2]$$

Year	Buildings r = 1/60	Construction r = 1/30	Machinery r = 1/20	Equipment r = 1/5	Transportation r = 1/20	Miscellaneous r = 1/3	Total
1956	0	0	0	0	0	-	0
1957	65	246	196	45	3	-	554
1958	102	367	274	60	4	-	807
1959	150	339	370	66	6	-	931
1960	219	563	507	80	9	-	1,378
1961	275	747	619	105	11	-	1,757
1962	299	824	666	108	12	-	1,908
1963	322	899	712	101	13	-	2,047
1964	337	956	742	212	15	-	2,262
1965	337	2,094	742	54	17	42	3,286
1966	337	4,154	742	28	21	85	5,368
1967	337	5,084	754	18	27	85	6,304
1968	337	5,290	800	16	31	56	6,531
1969	337	5,647	864	19	38	27	6,933
1970	441	5,808	1,141	26	45	27	7,488
1971	546	5,828	1,916	35	50	14	8,388
1972	734	5,840	3,417	64	57	153	10,267
1973	1,456	5,844	4,534	260	67	307	12,467
1974	2,286	6,154	4,854	482	76	307	14,158
1975	2,603	7,290	5,051	835	85	153	16,017

Table 78.
Net Stock; Constant 1969 US Dollars: Foreign Sector (Consortium)
(Dollars in thousands)

Year	Buildings	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1954	35,947	129,023	158,002	100,366	24,528	11,975	459,840
1955	38,292	124,573	145,677	62,418	23,135	4,309	398,406
1956	38,809	125,742	134,425	24,774	21,563	846	346,159
1957	50,164	138,910	135,291	7,681	22,076	1,923	356,045
1958	67,850	174,264	141,526	22,940	23,935	5,037	435,552
1959	83,676	214,501	136,850	29,476	25,502	4,983	494,987
1960	90,752	238,242	128,402	28,339	30,110	6,424	522,269
1961	97,088	261,211	125,464	24,562	29,341	3,523	541,189
1962	105,677	286,805	124,069	21,890	27,948	1,591	567,980
1963	110,030	316,732	110,392	17,109	24,815	819	579,896
1964	111,542	337,502	94,811	15,555	21,597	265	581,272
1965	111,670	414,635	100,258	20,719	20,904	(997)	667,189
1966	111,671	429,023	131,542	19,702	21,501	(1,165)	712,273
1967	111,810	439,522	150,465	16,950	21,145	(969)	738,924
1968	110,230	452,219	169,206	15,240	20,522	(677)	766,741
1969	107,977	483,097	186,601	14,927	19,742	(485)	811,860
1970	105,568	498,623	182,775	15,286	18,464	(515)	820,200
1971	103,329	554,985	184,837	11,111	17,345	(724)	870,883
1972	101,340	587,296	200,333	9,655	15,891	(702)	913,813
1973	99,451	658,071	196,373	9,210	15,598	(800)	977,905
1974	100,668	777,912	206,430	7,391	18,766	(700)	1,110,467
1975	105,817	997,700	250,833	6,687	21,885	1,902	1,364,825

Table 79.
Net Stock; Constant 1969 US Dollars: Production (Consortium)
(Dollars in thousands)

Year	Buildings	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1954	14,978	112,943	74,530	44,718	15,723	4,990	267,881
1955	17,531	108,244	69,446	28,330	14,488	1,880	239,920
1956	17,887	108,229	65,501	12,406	13,109	433	217,564
1957	22,535	122,368	71,847	3,901	11,780	1,040	233,471
1958	34,673	157,936	82,898	17,819	10,649	3,763	307,738
1959	47,876	197,616	84,819	24,426	9,403	3,892	368,033
1960	52,802	220,932	79,649	21,464	8,579	5,613	389,039
1961	56,016	242,886	75,325	15,703	7,124	2,785	399,839
1962	58,600	267,665	76,897	9,965	6,246	829	420,201
1963	59,762	297,055	69,239	5,599	4,797	59	436,510
1964	61,657	317,162	62,700	6,155	3,389	66	451,129
1965	62,868	388,111	63,541	13,230	3,672	101	531,524
1966	63,558	392,288	73,636	14,255	4,359	229	548,327
1967	64,249	400,370	85,407	11,335	4,237	261	565,858
1968	63,694	414,674	99,224	11,156	4,226	413	593,387
1969	62,547	447,549	108,805	11,699	4,379	468	635,447
1970	61,176	464,093	109,425	12,536	4,483	553	652,265
1971	60,042	521,717	116,587	9,038	4,380	425	712,190
1972	59,082	552,851	137,145	7,904	4,305	494	761,782
1973	57,943	624,989	138,003	7,741	4,470	427	833,574
1974	60,218	739,999	152,889	6,109	4,408	552	964,174
1975	66,554	937,146	201,599	5,472	5,404	3,173	1,219,347

Table 80.
Net Stock; Constant 1969 US Dollars: Refining (Consortium)
(Dollars in thousands)

Year	Building	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1954	20,969	16,080	83,472	55,648	8,805	6,985	191,959
1955	20,761	16,329	76,231	34,088	8,647	2,430	158,486
1956	20,922	17,513	68,924	12,368	8,455	413	128,595
1957	27,629	16,541	63,444	3,780	10,296	883	122,574
1958	33,177	16,328	58,628	5,121	13,286	1,274	127,814
1959	35,800	16,885	52,031	5,049	16,099	1,091	126,954
1960	37,950	17,310	48,753	6,876	21,530	811	133,230
1961	41,071	18,326	50,139	8,859	22,217	738	141,350
1962	47,078	19,139	47,172	11,926	21,702	763	147,780
1963	50,268	19,677	41,153	11,510	20,018	760	143,386
1964	49,886	20,340	32,112	9,340	18,207	199	130,143
1965	48,802	26,524	36,717	7,489	17,232	(1,098)	135,666
1966	48,113	36,735	57,905	5,447	17,141	(1,394)	163,947
1967	47,561	39,152	65,058	5,615	16,909	(1,230)	173,066
1968	46,536	37,545	69,982	4,084	16,296	(1,090)	173,354
1969	45,430	35,549	77,796	3,229	15,363	(952)	176,414
1970	44,391	34,530	73,350	2,750	13,981	(1,068)	167,934
1971	43,288	33,267	68,250	2,073	12,965	(1,149)	158,693
1972	42,258	34,445	63,188	1,751	11,586	(1,197)	152,031
1973	41,509	33,082	58,370	1,469	11,128	(1,227)	144,331
1974	40,450	37,913	53,541	1,282	14,358	(1,251)	146,292
1975	39,264	40,554	49,234	1,215	16,482	(1,271)	145,478

Table 81.
Net Stock; Constant 1969 US Dollars, NIOC
(Dollars in thousands)

Year	Building	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1956	1,975	14,949	2,914	121	479	-	20,439
1957	4,772	31,460	5,295	172	1,135	-	42,799
1958	7,928	49,864	7,661	214	1,855	-	67,522
1959	12,435	76,377	11,136	299	2,879	-	103,126
1960	18,918	114,480	16,180	442	4,349	-	154,369
1961	21,135	125,791	17,332	496	4,714	-	169,468
1962	22,063	128,952	17,291	302	4,740	-	173,348
1963	24,142	139,015	18,208	260	5,037	-	186,662
1964	26,337	146,434	16,845	177	7,377	540	197,710
1965	27,951	208,491	15,864	111	8,013	736	261,165
1966	28,239	255,576	14,517	59	8,490	199	307,180
1967	32,194	332,166	15,384	(50)	10,010	(205)	389,716
1968	35,475	526,448	17,548	174	13,296	68	593,008
1969	39,660	694,077	31,380	159	15,817	(1,623)	779,469
1970	57,609	794,022	42,235	198	17,089	(4,613)	906,540
1971	58,771	821,933	62,294	178	25,819	(5,289)	963,706
1972	79,611	888,700	102,355	587	27,335	(5,393)	1,093,194
1973	143,658	916,537	107,779	2,020	27,696	(5,700)	1,191,989
1974	183,377	916,206	110,160	2,007	29,320	153	1,241,223
1975	198,561	986,884	103,955	4,771	31,145	0	1,325,316

Table 82.
Net Stock; Constant 1969 US Dollars: Production, NIOC
(Dollars in thousands)

Year	Building	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1956	553	12,109	1,336	30	460	-	14,488
1957	1,336	25,483	2,337	42	1,090	-	30,288
1958	2,220	40,389	3,442	54	1,781	-	47,886
1959	3,482	61,716	5,038	75	2,764	-	73,075
1960	5,297	92,430	7,354	110	4,175	-	109,367
1961	5,918	101,443	7,885	99	4,525	-	119,870
1962	6,178	103,855	7,871	75	4,550	-	122,528
1963	6,760	111,856	8,294	64	4,836	-	131,810
1964	9,292	119,797	7,673	193	7,145	540	144,641
1965	11,243	116,120	7,431	181	7,756	523	143,255
1966	11,869	111,550	6,827	157	8,139	71	138,613
1967	16,161	193,225	7,976	118	9,585	(247)	226,816
1968	19,779	380,428	9,572	264	12,821	(152)	422,864
1969	24,284	544,668	23,067	269	15,171	(1,664)	605,794
1970	30,294	649,830	25,182	257	16,419	(4,626)	717,354
1971	31,808	682,929	26,020	260	25,100	(5,289)	760,828
1972	30,866	755,418	30,578	461	26,462	(6,160)	837,625
1973	32,376	789,043	34,816	369	26,720	(6,161)	877,164
1974	38,774	776,331	34,949	310	28,227	0	878,592
1975	54,122	804,636	33,048	825	29,970	0	922,602

Table 83.
Net Stock; 1969 US Dollars: Refining, NIOC
(Dollars in thousands)

Year	Building	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1956	1,422	2,840	1,579	91	19	-	5,951
1957	3,436	5,977	2,922	130	45	-	12,511
1958	5,708	9,474	4,219	161	74	-	19,636
1959	8,953	14,661	6,098	224	115	-	30,051
1960	13,621	22,050	8,826	331	174	-	45,002
1961	15,217	24,348	9,446	397	189	-	49,597
1962	15,885	25,098	9,421	227	190	-	50,820
1963	17,382	27,159	9,914	195	201	-	54,852
1964	17,045	26,638	9,172	(16)	231	-	53,070
1965	16,708	92,371	8,433	(70)	257	212	117,911
1966	16,371	144,026	7,691	99	352	127	168,468
1967	16,033	138,942	7,408	(167)	426	42	162,684
1968	15,696	146,021	7,976	(91)	475	68	170,145
1969	15,376	149,409	8,313	(109)	645	41	173,674
1970	27,315	144,192	17,053	(59)	670	14	189,186
1971	26,963	139,004	36,275	(82)	718	0	202,878
1972	48,745	133,282	71,777	127	872	767	255,570
1973	111,282	127,494	72,963	1,651	975	460	314,825
1974	144,603	139,875	75,210	1,697	1,092	153	362,632
1975	144,439	182,248	70,907	3,946	1,175	0	402,714

Table 84.
Net Annual Investment; 1969 US Dollars
(Dollars in thousands)

Year	Producing (Consortium)	Refining (Consortium	Producing (NIOC)	Refining (NIOC)
1955	(27,961)	(33,473)	-	-
1956	(22,356)	(29,891)	-	-
1957	15,907	(6,021)	15,800	6,560
1958	74,267	5,240	17,598	7,125
1959	60,295	(860)	25,189	10,415
1960	21,006	6,276	36,292	14,951
1961	10,800	8,120	10,503	4,595
1962	20,362	6,430	2,658	1,223
1963	16,309	(4,394)	9,282	4,032
1964	14,619	(13,243)	12,831	(1,782)
1965	80,595	5,523	(1,386)	64,841
1966	16,803	28,281	(4,642)	50,557
1967	17,531	9,119	88,203	(5,784)
1968	27,529	288	196,048	7,461
1969	42,060	3,060	182,930	3,529
1970	16,818	(8,480)	111,560	15,512
1971	59,925	(9,241)	43,474	13,692
1972	49,592	(6,662)	76,797	52,692
1973	71,792	(7,700)	39,539	59,255
1974	130,600	1,961	1,428	47,807
1975	255,173	(814)	44,010	40,082

Figures in brackets are negative.

Table 85.
Age Composition of Capital Stock; Production (Consortium)

Year	Building 1=60	Construction 1=30	Machinery 1=20	Equipment 1=5	Transportation 1=20	Miscellaneous 1=3	Age Index Y	Life Expectancy L	$\frac{Y}{L} \cdot 100$
1954	30	15	10	2.50	10	1.50	11.80	23.60	50
1955	29	15.65	10.65	3.45	10.75	2.40	13.25	25.35	52
1956	25.50	15.60	11.20	4.20	11.65	0.80	14.15	27.60	51
1957	20.80	14.00	10.35	1.55	12.40	1.10	13.20	28.90	45
1958	14.40	11.65	9.50	1.05	12.90	1.25	10.55	28.25	37
1959	11.30	10.00	9.50	1.25	13.70	1.35	9.45	29.40	32
1960	11.00	9.75	10.20	2.10	14.30	1.45	9.45	29.65	32
1961	11.20	9.55	10.70	2.85	14.80	1.80	10.05	30.85	32
1962	11.50	9.40	10.95	4.85	15.15	2.40	9.85	31.75	31
1963	12.10	9.30	10.55	3.65	15.90	1.60	9.90	32.25	31
1964	12.48	9.40	12.55	2.60	16.65	1.45	10.45	32.65	32
1965	13.05	8.70	5.85	1.50	5.00	1.65	8.70	31.80	27
1966	13.65	9.70	6.00	1.30	5.05	1.50	9.45	31.45	30
1967	14.25	9.80	6.00	2.40	5.80	1.75	9.60	31.00	31
1968	15.05	10.15	6.15	2.60	6.65	1.40	9.80	30.95	32
1969	15.90	10.10	6.40	2.80	7.70	1.20	9.90	30.85	32
1970	16.90	10.10	7.05	2.95	6.60	1.40	10.00	30.40	33
1971	17.80	7.00	7.35	2.50	8.35	1.75	7.85	30.20	26
1972	18.65	7.45	7.40	2.95	8.30	1.55	8.30	30.35	27
1973	19.55	7.50	7.90	2.90	9.25	1.40	8.40	30.05	28
1974	19.65	7.30	8.05	2.90	10.35	1.65	8.15	32.90	25
1975	18.90	6.90	7.40	2.40	12.00	0.60	7.70	29.55	26

Table 86.

Age Composition of Capital Stock; Refining (Consortium)

Year	Building 1=60	Construction 1=30	Machinery 1=20	Equipment 1=5	Transportation 1=20	Miscellaneous 1=3	Age Index γ	Life Expectancy L	$\frac{\gamma}{L} \cdot 100$
1954	30	15	10	2.50	10	1.50	10.08	20.16	50
1955	30.30	14.80	10.85	3.45	10.20	2.45	12.00	22.70	53
1956	30.10	14.00	11.70	4.40	10.40	0.90	14.75	26.30	56
1957	23.40	15.80	12.30	1.00	9.00	0.93	14.50	29.58	49
1958	25.15	16.00	12.75	1.45	7.75	1.10	15.35	30.93	49.65
1959	19.30	15.70	13.45	3.00	7.10	1.65	14.00	31.75	44.00
1960	18.80	15.55	13.65	2.10	6.25	1.85	13.45	31.60	42.55
1961	18.10	15.10	13.25	2.20	6.65	1.55	13.05	31.85	41.00
1962	16.65	14.90	13.45	2.10	7.35	1.95	12.85	32.90	39.05
1963	16.35	14.90	15.20	2.25	8.25	1.50	13.55	34.20	39.60
1964	17.10	14.80	14.75	2.75	9.15	2.00	14.02	35.75	39.20
1965	18.00	12.90	4.50	3.00	6.25	2.50	11.00	35.10	31.35
1966	18.80	10.83	3.80	3.25	6.95	0	12.55	33.45	37.50
1967	19.50	10.90	4.25	2.65	7.65	0.50	10.20	32.65	31.25
1968	20.40	11.75	4.75	2.75	8.40	0.95	10.80	32.70	33.00
1969	21.30	12.60	5.10	2.95	9.25	1.30	11.00	31.80	34.60
1970	22.20	6.75	6.10	2.95	10.25	1.65	10.70	32.20	33.20
1971	23.10	7.75	7.10	3.25	11.10	1.80	11.85	32.75	36.20
1972	23.95	8.25	8.05	2.53	12.05	1.55	12.90	33.45	38.55
1973	24.70	9.25	9.00	2.90	12.65	1.62	12.95	33.95	38.15
1974	25.55	9.05	9.95	2.95	11.80	1.60	14.30	33.90	42.20
1975	26.45	9.30	10.95	2.75	10.70	1.60	14.65	33.60	43.60

Table 87.

Age Composition of Capital Stock; Producing, NIOC

Year	Buil-ding 1=60	Construc-tion 1=30	Machi-nery 1=20	Equip-ment 1=5	Transpor-tation 1=20	Miscel-laneous 1=30	Age Index γ	Life Expectancy L	$\frac{\gamma}{L} \cdot 100$
1956	30.00	15.00	10.00	2.50	10.00	0	15.00	30.00	50.00
1957	13.00	7.60	6.10	2.07	4.70	0	7.60	30.00	25.25
1958	8.50	4.95	4.80	2.15	3.60	0	7.60	30.40	25.00
1959	6.20	4.00	4.05	1.30	3.10	0	4.10	30.40	13.50
1960	4.90	3.80	3.55	1.65	2.85	0	3.80	30.50	12.45
1961	5.25	4.35	4.10	2.35	3.45	0	4.35	30.50	14.25
1962	5.90	5.05	4.85	2.80	4.20	0	5.05	30.50	16.80
1963	6.30	5.55	5.35	3.05	4.75	0	5.55	30.50	18.20
1964	5.50	6.00	6.35	1.73	4.15	0.50	5.85	30.55	19.15
1965	5.40	6.90	7.15	1.76	4.65	1.10	6.60	31.15	21.20
1966	6.00	7.90	8.10	2.25	5.20	1.85	7.60	31.60	24.00
1967	5.35	5.75	7.90	2.25	5.50	1.20	5.80	31.30	18.55
1968	5.25	3.90	7.50	2.35	4.90	0.95	4.05	31.00	13.05
1969	5.20	3.60	4.45	1.80	5.05	1.20	3.75	30.60	12.25
1970	5.00	3.90	4.90	2.15	5.45	1.95	3.95	30.60	12.90
1971	5.80	4.55	5.45	2.48	4.60	2.50	4.65	30.60	15.20
1972	6.45	5.07	5.55	2.25	5.15	0	5.20	30.75	16.90
1973	7.40	5.70	5.70	2.20	5.85	0	5.55	30.75	18.00
1974	7.10	6.60	6.30	2.60	6.30	0	6.45	30.80	21.00
1975	6.00	7.15	6.20	1.75	6.70	0	7.00	31.10	22.50

Table 88.

Age Composition of Capital Stock; Refining, NIOC

Year	Building 1=60	Construction 1=30	Machinery 1=20	Equipment 1=5	Transportation 1=20	Miscellaneous 1=30	Age Index γ	Life Expectancy L	$\frac{\gamma}{L} \cdot 100$
1956	30.00	15.00	10.00	2.50	10.00	-	17.00	34.00	50.00
1957	12.90	9.00	5.80	2.06	4.65	-	9.20	35.45	26.00
1958	8.50	6.00	4.70	2.20	3.55	-	6.40	36.05	17.75
1959	6.20	4.50	4.00	1.35	3.06	-	4.90	36.75	13.35
1960	4.90	3.75	3.60	1.65	2.85	-	4.05	36.75	11.00
1961	5.25	4.25	4.15	2.40	3.45	-	4.50	36.75	12.25
1962	5.90	5.00	4.90	2.85	4.20	-	5.25	37.15	14.15
1963	6.30	5.45	4.50	3.05	4.75	-	5.55	37.70	14.70
1964	7.30	6.35	5.50	3.55	5.00	-	6.55	37.80	17.35
1965	8.30	2.65	6.49	3.05	5.30	0.50	3.75	33.40	11.25
1966	9.30	2.50	7.49	3.85	4.85	1.50	3.45	32.50	10.60
1967	10.30	3.50	8.00	4.50	5.10	2.50	4.80	32.50	14.75
1968	11.30	4.20	8.20	0.50	5.35	0.50	5.40	32.20	16.75
1969	11.28	5.10	8.50	1.50	4.90	1.50	6.25	32.20	19.40
1970	8.50	6.00	5.90	1.60	5.50	2.50	6.35	33.20	19.15
1971	8.45	7.00	3.95	2.45	5.90	0	7.35	32.10	22.90
1972	8.10	7.63	2.90	1.70	5.80	0.50	7.15	32.80	21.80
1973	4.40	8.62	3.70	0.75	6.00	1.50	5.95	37.85	15.70
1974	4.30	8.75	4.40	1.50	6.20	2.50	7.00	39.90	17.55
1975	5.20	7.85	5.35	1.40	6.55	0	6.40	38.75	16.50

Table 89.

Net Stock; Annual Growth Rates, Producing: (Consortium) | Net Stock; Annual Growth Rates: Refining, (Consortium)

$$r = \frac{x_n - x_{n-1}}{x_{n-1}} \cdot 100$$

Year	Producing: Buildings	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total	Refining: Buildings	Construction	Machinery	Equipment	Transportation	Miscellaneous	Total
1955	+17	-4	-7	-37	-8	-62	-10	-1	2	-9	-39	-2	-62	-17
1956	2	0	-6	-56	-10	-77	-9	1	7	-10	-64	-2	-83	23
1957	26	13	10	-69	-10	140	7	35	-6	-8	-69	22	114	-5
1958	54	29	15	357	-10	262	32	20	-1	-8	35	29	44	4
1959	38	25	2	37	12	3	20	8	3	-11	-1	21	-14	-1
1960	10	12	-6	12	-9	44	6	6	3	-6	36	34	-26	5
1961	6	10	-5	-26	-17	-50	3	8	6	3	29	3	-9	6
1962	4	10	2	-37	-12	-70	5	15	4	-6	35	-2	3	5
1963	2	11	-10	-44	-23	-93	4	7	3	-13	-3	-8	0	-3
1964	3	7	9	10	-29	12	3	-1	3	-22	-18	-9	-74	-9
1965	2	22	1	115	8	53	18	-2	30	14	-20	-5	-652	4
1966	-1	1	16	8	19	127	3	-1	38	57	-27	-1	-27	21
1967	1	2	16	-20	-3	14	3	-1	7	12	3	-1	12	6
1968	-1	4	16	-2	0	58	5	-2	-4	8	-27	-4	11	0
1969	-2	8	10	5	4	13	7	-2	-5	11	-21	-6	12	2
1970	-2	4	1	7	2	18	3	-2	-3	-6	-15	-9	-12	-5
1971	-2	12	7	-28	-2	-23	9	-2	-4	-7	-24	-7	-8	-6
1972	-2	6	18	-13	-2	16	7	-2	4	-7	-16	-11	-4	-4
1973	-2	13	1	-2	-1	-14	9	-2	-4	-8	-16	-4	-3	-5
1974	4	18	11	-21	-2	29	16	-3	15	-8	-13	29	-2	1
1975	11	27	32	-10	23	475	26	-3	7	-8	-5	15	-2	-1

Table 90.

Net Stock; Annual Growth Rates: Producing, NIOC — Net Stock; Annual Growth Rates: Refining, NIOC

$$r = \frac{x_n - x_{n-1}}{x_{n-1}} \cdot 100$$

Year	Producing: Buildings	Producing: Construction	Producing: Machinery	Producing: Equipment	Producing: Transportation	Producing: Miscellaneous	Producing: Total	Refining: Buildings	Refining: Construction	Refining: Machinery	Refining: Equipment	Refining: Transportation	Refining: Miscellaneous	Refining: Total
1957	142	110	75	40	137	-	109	142	110	85	43	137	-	110
1958	66	58	47	29	63	-	58	66	59	44	24	64	-	57
1959	57	53	46	39	55	-	53	57	55	45	39	55	-	53
1960	52	50	46	47	51	-	50	52	50	45	48	51	-	50
1961	12	10	7	-10	32	-	10	12	10	7	20	9	-	10
1962	4	2	0	-24	1	-	2	4	3	0	-43	1	-	2
1963	9	8	5	-15	6	-	8	9	8	5	-14	6	-	8
1964	37	7	-7	202	48	+∞	10	-2	-2	-7	-108	14	-	-3
1965	21	-3	-3	-6	9	-3	-1	-2	247	-8	-337	11	+∞	122
1966	6	-4	-8	-13	5	-86	-3	-2	56	-9	-41	37	-40	43
1967	36	73	17	-25	18	-448	64	-2	-4	-4	-69	21	67	-3
1968	22	97	20	124	34	100	86	-2	5	8	46	12	62	5
1969	23	43	141	2	18	-1095	43	-2	2	4	-20	36	-40	2
1970	25	19	9	-4	8	-178	18	78	3	105	-46	4	-66	9
1971	5	5	3	1	53	-14	6	-1	-4	113	-39	7	-∞	27
1972	-3	11	18	77	5	-16	10	81	-4	98	255	21	+∞	26
1973	5	4	14	-20	1	0	5	128	-4	2	1200	12	-40	23
1974	20	-2	0	-16	6	-∞	0	30	10	3	1	12	-67	15
1975	40	4	-5	166	6	0	5	0	30	-6	133	8	-∞	11

Table 91.

Depreciation and Fixed Assets Charges; Constant 1969 (000) US Dollars

Consortium

	Producing			Refining			
Year	Depreciation	Fixed Assets Charges	Total	Depreciation	Fixed Assets Charges	Total	Grand Total
1957	10,942	18,254	29,196	2,455	10,942	13,397	42,593
1958	6,254	18,606	24,860	1,421	11,654	13,075	37,935
1959	7,640	18,961	26,601	1,395	14,066	15,461	42,062
1960	8,152	19,400	27,552	1,627	15,616	17,243	44,795
1961	8,912	27,573	36,485	2,311	20,136	22,447	58,932
1962	6,437	23,373	43,744	2,480	18,332	20,812	64,556
1963	6,118	23,918	30,035	2,222	15,832	18,054	48,089
1964	3,506	24,817	28,324	1,967	16,002	17,969	46,293
1965	2,268	20,628	22,896	1,765	4,265	6,030	28,926
1966	1,532	25,109	26,642	1,577	5,948	7,525	34,167
1967	1,546	28,412	29,958	1,216	6,141	7,357	37,315
1968	1,502	24,595	26,097	737	8,513	9,250	35,347
1969	1,248	24,118	25,366	557	7,003	7,560	32,926
1970	1,442	28,424	29,866	571	7,303	7,874	37,740
1971	715	20,084	20,799	514	8,310	8,824	29,623
1972	753	22,946	23,699	492	7,987	8,479	32,178

Deflated by General Index.

Source: Computed by British Petroleum; conveyed to author in a letter dated 27th May, 1976.

Table 92

Fixed Assets Charges and Movable Assets Depreciation

(Constant 1969 US Dollars in thousands)

	REFINING					PRODUCING					
Year	Fixed Assets charges Article 6A of agreement	Fixed Assets charges Art. 6B of agreement	Non-basic assets charges Art. 17D Note 5 of agreement	Movable assets depre-ciation	Total Refining	Fixed Assets charges Art. 6A of agreement	Fixed Assets charges Art. 6B agreement	Non-basic assets charges Art. 17D of agreement	Movable assets depre-ciation	Drilling Amorti-zation	Total Producing
1955	23,433	-	1,638	-	25,066	13,123	-	-	1,799	-	14,922
1956	18,977	13	13,307	13	32,310	10,628	807	586	2,134	-	14,154
1957	17,957	26	285	2,384	20,652	10,056	348	542	4,147	-	15,093
1958	17,936	83	887	1,217	20,123	9,876	629	1,145	6,382	-	18,032
1959	16,742	404	1,810	1,298	20,254	9,376	2,836	1,854	6,335	-	20,401
1960	16,513	710	2,130	1,458	20,811	9,248	3,799	2,570	6,279	-	21,896
1961	16,022	1,120	2,573	1,003	20,718	8,973	14,580	4,011	4,961	-	32,525
1962	16,518	1,981	3,039	542	22,080	9,250	17,415	4,452	4,491	-	35,608
1963	16,110	3,687	4,067	1,156	25,020	9,022	18,179	4,566	(3,306)	-	28,461
1964	15,968	3,899	4,813	1,395	26,075	8,943	18,869	5,125	(1,655)	9,052	40,334
1965	0	4,266	4,946	1,345	10,577	0	20,599	5,178	(474)	6,955	32,258
1966	0	16,337	4,841	818	21,996	0	54,083	5,133	(1,149)	7,878	65,945
1967	0	6,131	4,491	875	11,497	0	28,337	4,680	4	12,260	45,281
1968	0	8,325	3,444	1,019	12,788	0	24,074	2,031	(187)	10,169	36,087
1969	0	6,823	2,220	(360)	8,683	0	23,506	1,992	199	11,582	37,279
1970	0	6,822	2,704	44	9,570	0	28,097	1,987	(1,455)	12,160	40,789
1971	0	7,673	2,317	73	10,063	0	19,336	1,697	(90)	13,724	34,667
1972	0	7,607	1,367	107	9,081	0	22,180	1,230	(30)	17,617	40,997
1973	0	1,797	867	40	2,704	0	4,706	486	109	4,101	9,402*

* Year 1973 covers only three months, January to March 20th.

Source: Balance sheets of Iranian Oil Exploration and Producing Company 1954-1973.
Balance sheets of Iranian Oil Refining Company, 1954-1973.

All figures are deflated according to the general Index of Chapter V.

APPENDIX 10

Tables 10.1 - 10.7.

Table 10.1.

Net Production (000) Barrels

		Fields	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
LIGHT CRUDE	Central Areas	1. Masjidi-Suleiman	12,027	14,397	15,050	13,522	16,351	17,098	12,719	14,305	14,587		12,515
		2. Haftkel	14,299	30,753	43,980	52,519	54,921	59,466	45,660	48,653	46,951		38,016
		3. Naft-e Safid	2,533	7,643	15,698	21,857	19,728	14,981	12,178	11,356	10,085	68,263	8,512
		4. Par-e Siah	-	-	-	-	-	-	-	-	-		-
		5. Lab-e Safid	-	-	-	-	-	-	-	-	-		-
		6. Lali	1,931	2,580	3,868	6,376	5,449	4,718	3,974	2,753	2,910		1,748
		7. Agha-Jari	88,164	135,509	165,269	183,600	218,771	244,715	258,200	281,250	286,620	315,912	304,037
		8. Pazanan	-	-	-	-	-	-	-	-	-	5,216	6,582
		9. Karanj	-	-	-	-	-	-	-	-	-	1,850	25,069
		10. Marun	-	-	-	-	-	-	-	-	-	-	9
		11. Paris	-	-	-	-	-	-	-	-	-	-	-
HEAVY CRUDE		12. Ahwaz	-	-	-	-	18	2,208	2,597	11,888	35,372	49,181	60,733
		13. Kharg	-	-	-	-	-	-	-	-	-	346	2,964
		14. Bibi-Hakimeh	-	-	-	-	-	-	-	-	-	1,209	13,978
		15. Gach Saran	48	4,697	17,626	21,626	21,605	40,192	92,159	104,890	130,856	163,867	185,704
		16. Rag-e Safid	-	-	-	-	-	-	-	-	-	-	-
		17. Ramshir	-	-	-	-	-	-	-	-	-	-	-
		18. Binak	-	-	-	-	-	-	-	-	-	-	-
		19. Kupal	-	-	-	-	-	-	-	-	-	-	-
		20. Mansuri	-	-	-	-	-	-	-	-	-	-	-
		Total	119,002	195,580	261,482	299,499	336,843	383,378	427,488	475,096	527,172	605,845	659,868

Totals may not add up due to rounding.

Source: Iranian Oil Participants Ltd, '<u>Treasury Department Records</u>', 1955 through 1975.

1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
11,367	12,762	10,843	8,048	6,365	2,845	3,277		4,258	3,317
34,156	28,025	23,670	17,753	15,790	16,106	14,907		12,603	10,675
9,807	7,920	9,237	11,331	11,675	11,831	11,531	35,982	12,889	13,238
-	-	-	-	738	4,805	3,768		2,776	1,560
-	-	-	-	-	-	-		8,032	6,573
973	95	896	735	506	593	338			
285,084	335,485	321,705	314,146	299,096	316,654	346,911	373,405	361,886	302,900
20,826	20,418	16,724	14,803	10,890	9,773	6,620	8,846	12,483	11,021
26,303	29,793	30,481	26,795	37,672	71,440	72,613	98,776	108,585	85,987
16,482	57,563	156,284	214,321	269,789	326,013	381,914	386,659	384,869	434,408
1,667	6,917	6,673	6,622	24,820	126,850	141,190	164,615	132,109	71,169
62,355	59,617	74,190	87,509	94,754	96,947	136,259	311,304	350,020	373,889
3,218	4,783	5,653	7,163	7,464	8,099	23,037	26,757	20,928	14,979
25,888	83,199	111,227	134,619	158,967	162,632	159,462	133,520	130,442	95,409
235,460	242,621	205,340	264,397	307,185	321,996	315,183	323,910	336,349	248,670
1,380	7,886	10,707	8,524	14,017	13,169	20,998	72,352	105,546	78,152
1,493	3,149	1,800	1,658	501	1,611	3,889	5,410	7,029	5,857
-	60,998	4,236	13,255	15,864	19,076	18,876	20,057	20,051	11,701
-	-	-	-	-	2,248	1,474	6,479	7,718	5,276
-	-	-	-	-	-	-	-	4,335	4,680
736,241	900,293	989,665	1,131,680	1,276,093	1,512,689	1,662,247	1,968,073	2,022,909	1779,481

Producing Personnel

Departments and Fields	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
1. Head Office[1]		68	98	110	133	152	191	320	331	275	280
2. Non-basic[2]		-	-	n.a.	1,506	2,431	5,282	4,751	4,747	4,392	
3. Masjidi-Suleiman		5,604	5,651	5,351	5,114	4,764	1,649	1,808	1,678	1,664	
4. Lali		698	642	514	471	451					
5. Haft-kel		931	872	872	712	1,089	473	438	354	290	
6. Naft Safid		847	812	714	639						
7. Ahwaz & Qarait		2,463	2,500	2,263	2,242	1,991	1,329	1,365	1,247	710	
8. Agha Jari		3,339	3,327	3,087	3,024	2,755	1,279	1,407	1,337	1,309	
9. Gachsaran		502	692	1,494	1,491	979	496	390	437	466	
10. Bandar Mashur		2,384	2,356	2,207	2,141	1,777	1,062	822	757	707	
11. Pipelines		831	752	713	674	660	-	-	-	-	
12. Kharg Island		-	-	1,620	2,409	1,087	119	117	130	154	
13. Foreign Staff		-	-	223	223	246	199	175	152	-	
14. Field's Construction		-	-	-	-	1,631	1,452	588	380	1,302	
15. Field's Headquarters		-	-	-	-	-	1,807	1,057	1,121	795	
Total	18,658	17,667	17,704	19,168	20,796	20,013	15,338	13,238	12,471	12,064	11,837
Exploration	382	200	196	142	133	94	-	-	-	-	-

	1966	1967	1968	1969	1970	1971	1972	1973
1. Head Office	327	305	342	433	460	499	532	-
Total	11,426	10,431	9,382	8,449	7,737	7,260	7,484	-
Exploration	-	-	-	-	-	-	-	-

1. The proportion of salaries paid in each sector has served as criterion for allocating head office personnel.
2. The average ratio of producing 'non-basics' to refining 'non-basics' of 37/63 through 1968-72 is the assumed criterion for allocating 'non-basics' personnel to each sector.

Source: Operating Companies Annual Reports 1955 - 1973, Iran-Oil Journal, all available issues.

Items	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
1. Salaries	4,909	6,726	10,688	10,760	11,040	13,233	14,661	11,794	11,472	11,164	11,721
2. Wages	12,558	14,255	15,319	17,872	18,351	17,808	21,291	10,352	8,940	9,730	8,940
3. Contract payments	1,282	4,514	10,870	13,468	16,478	19,065	25,620	29,145	29,453	12,712	15,092
4. Materials	2,243	5,457	9,820	11,810	9,912	15,725	13,292	13,012	12,625	5,676	6,530
5. Fuel	885	602	1,025	1,005	1,028	1,240	1,179	1,014	1,089	-	-
6. Iranian Oil services charges	-	-	1,159	888	986	1,011	1,022	1,044	1,056	1,064	1,226
7. Tehran, Head Office charges	-	-	1,758	2,932	3,948	5,368	5,166	4,382	3,951	5,978	5,908
8. Sundries	1,688	1,022	4,326	3,942	6,093	7,988	15,165	7,689	6,863	4,665	4,407
9. Depreciation	1,036	1,361	2,769	4,203	5,410	5,852	6,594	4,620	4,503	2,604	1,705*
10. Fixed Assets Charges	6,639	6,689	6,866	7,062	8,646	9,366	20,401	16,775	17,601	18,424	15,506
11. Non-basic Assets Charges	-	36	358	770	1,313	1,845	-	-	-	11,696*	7,686**
12. Chemicals	-	-	-	-	-	-	-	-	-	-	-
13. Agha-Jari Gas	-	-	-	-	-	-	-	-	-	-	-
14. Compensation & Gratuities	-	-	-	-	-	-	-	6,219	1,666	1,148	871
15. NIOC	-	-	-	-	-	862	1,534	29,904	29,019	30,310	28,165
16. Field Gas	-	-	-	-	-	-	-	-	-	-	-
17. Company made products	-	-	-	-	-	-	-	-	-	-	-
18. Auxiliaries	-	-	-	-	-	-	-	-	-	-	2,797
19. Service Expenditure	-	-	-	-	-	-	-	-	-	3,002	-
20. Charges from other centres	-	-	-	-	-	-	1,938	1,932	2,022	-	-
21. Commissary supplies	-	-	-	-	-	-	3,727	-	-	-	-
Less: Recoveries & Expenses capitalized											
22. Topping Plant Costs Recovered from Refining Company	-	-	7,974	7,269	8,148	12,202)	) 14,143	16,229	16,887	18,004	16,898
23. Decrease (Increase) in Manufactured Stock	-	-	330	426	291	325)					
24. Add Interest on Bank Deposits	-	17	50	17	-	-	-	-	-	-	-
25. Total	31,234	40,647	56,703	67,034	74,763	86,839	117,443	121,654	113,372	100,136	93,654
26. Operating Profits	2,811	4,687	6,348	7,235	8,179	9,335	10,578	13,104	13,104	15,019	0
	34,045	45,334	63,051	74,296	82,942	96,174	128,021	134,758	126,476	115,155	

* Includes Amortization and Exploration drilling.

** Including land assets charges.

1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
11,668	11,121	11,174	11,724	1,2142	12,869	14,820	21,457	31,280	57,464
9,335	8,994	7,824	8,201	7,740	7,155	7,915	10,690	14,708	20,390
16,864	15,849	15,977	19,546	18,905	20,066	27,402	36,115	55,142	90,608
6,320	6,267	7,505	9,170	7,178	7,707	8,660	11,893	17,714	30,777
1,075	1,075	1,286	1,529	1,459	1,800	2,426	3,262	3,287	6,134
6,434	6,056	6,014	6,336	9,343	12,508	13,105	20,798	20,204	-
4,385	5,918	7,368	6,024	9,372	10,086	11,792	19,740	21,269	22,624
1,232	1,274	1,363	1,248	1,519	817	917	824	1,670	2,938
20,188*	23,420**	22,320**	24,118	39,571	22,960	22,955	37,561	40,200	42,985
11,410**	12,238*	13,783*	13,594	24,720	20,699	26,077	31,144	53,480	75,712
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
804	3,280	2,642	4,334	2,880	2,906	3,345	2,678	4,814	7,896
28,560	29,797	27,134	28,390	27,955	28,305	30,270	33,819	46,331	55,907
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
5,995	6,237	5,143	6,547	6,449	6,409	9,805	10,737	18,089	34,487
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
19,236	19,915	26,040	23,162	22,762	23,261	29,302	30,612	39,069	74,064
-	-	-	-	-	-	-	-	-	-
105,034	111,402	103,493	117,595	136,872	131,126	155,290	214,169	289,116	447,922
0	0	0	0	0	0	0	0	0	0

Table 10.4.

Producing Operating Costs (000) U.S. 1969 Constant Dollars

Items	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
1. Salaries	7,956	10,024	15,247	15,198	13,800	15,334	16,717	13,327	12,832	11,966	12,539
2. Wages	20,335	21,244	21,853	25,243	22,939	20,635	24,277	11,697	10,000	10,429	9,561
3. Contract Payments	2,051	7,222	16,470	20,042	23,274	26,553	34,622	40,592	39,599	17,132	20,069
4. Materials	4,433	8,731	14,879	17,574	14,000	21,901	17,962	18,123	17,154	7,588	8,684
5. Fuel	752	511	810	793	901	1,054	1,027	897	986	-	-
6. Iranian Oil Services Charges	-	-	1,756	1,321	1,393	1,408	1,381	1,454	1,435	1,434	1,630
7. Tehran Head Office Charges	-	-	2,664	4,363	5,576	7,476	6,981	6,103	5,368	8,057	7,856
8. Sundries	3,336	1,635	6,555	5,866	8,606	11,125	20,493	10,709	9,325	6,287	5,860
9. Depreciation	2,047	2,178	4,195	6,254	7,641	8,150	8,911	6,435	6,118	3,509	2,267*
10. Fixed Assets Charges	13,121	10,702	10,403	10,509	12,212	13,045	27,569	23,364	23,914	24,830	20,620
11. Non-basic Assets Charges	-	58	542	1,146	1,855	2,570	-	-	-	15,763*	10,221**
12. Chemicals	-	-	-	-	-	-	-	-	-	-	-
13. Agha Jari Gas	-	-	-	-	-	-	-	-	-	-	-
14. Compensation & Gratuities	-	-	-	-	-	-	-	7,027	1,864	1,230	932
15. NIOC	-	-	-	-	-	999	1,749	33,790	32,460	32,487	30,123
16. Field Gas	-	-	-	-	-	-	-	-	-	-	-
17. Company Made Products	-	-	-	-	-	-	-	-	-	-	-
18. Auxiliaries	-	-	-	-	-	-	-	-	-	-	3,719
19. Service Expenditure	-	-	-	-	-	-	-	-	-	3,218	-
20. Charges from other centres	-	-	-	-	-	-	2,619	2,691	2,747	-	-
21. Commissary Supplies	-	-	-	-	-	-	5,036	-	-	-	-
Less:											
22. Recoveries & Expenses capitalized	-	-	12,582	11,451	11,919	17,503	19,112	22,603	22,944	24,264	22,471
	-	27	76	26							
23. Total	54,031	62,278	82,716	96,832	100,278	112,747	150,232	153,606	140,858	119,666	111,610
24. Operating Profits	5,555	7,499	9,618	10,766	11,552	13,001	14,295	18,251	17,804	20,241	-
25. Sum Total											

1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
12,374	11,694	11,567	11,724	11,963	12,016	13,023	16,962	21,768	25,692
9,899	9,457	8,099	8,201	7,626	6,681	6,955	8,451	10,235	12,665
20,975	19,234	17,615	19,546	17,936	17,556	22,498	24,635	32,303	45,440
7,861	7,606	8,275	9,170	6,810	6,743	7,110	8,113	10,377	15,435
-	-	-	-	-	-	-	-	-	-
1,337	1,305	1,418	1,529	1,384	1,575	1,992	2,225	1,926	3,076
8,002	7,350	6,631	6,336	8,864	10,943	10,759	14,187	11,836	-
5,454	7,182	8,123	6,024	8,892	8,824	9,681	13,465	12,460	11,346
1,532	1,546	1,503	1,248	1,441	715	753	562	978	1,473
25,109*	28,422**	24,609**	24,188	37,544	20,087	18,846	25,621	23,550	21,557
14,192**	14,852*	15,196*	13,594	23,454	18,109	21,410	21,244	31,330	37,970
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
853	3,449	2,735	4,334	2,837	2,713	2,947	2,117	3,350	4,904
30,286	31,332	28,089	28,390	27,542	26,429	26,599	26,734	32,241	34,725
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
6,357	6,558	5,324	6,547	6,354	5,984	8,616	8,488	12,588	21,420
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
23,925	24,169	28,710	23,162	21,596	20,351	24,057	20,881	22,888	37,143
120,306	125,818	110,474	117,669	141,051	118,024	127,132	151,923	182,054	208,560
-	-	-	-	-	-	-	-	-	-

Table 10.5.

Oil Field and Production Unit Data: 1st May 1974.

Field/Unit	Capacity	API Asmari	API Bangestan	API Khami
AGHA JARI	1,300,000	34	34	-
Prod. Unit No. 1	260,000			
Prod. Unit No. 2	285,000			
Prod. Unit No. 3	290,000			
Prod. Unit No. 4	240,000			
Prod. Unit No. 5	225,000			
AHWAZ	1,092,000	32.3	25.2	-
Prod. Unit No. 1	412,000			
Prod. Unit No. 2	420,000			
Prod. Unit No. 3	160,000			
BIBI HAKIMEH	505,000	29,9	29.8	-
Prod. Unit No. 1	230,000			
Prod. Unit No. 2	275,000			
BINAK	58,000	30.2	29.9	-
GACHSARAN	970,000	31.4	31.0	
Prod. Unit No. 1	210,000			
	220,000			
	540,000			
HAFT KEL	120,000	37.5	-	-
Prod. Unit No. 1	60,000			
Prod. Unit No. 4	60,000			
Karanj	875,000	34.1	-	-
Prod. Unit No. 1	750,000			
WHS No. 1	75,000			
WHS No. 2	50,000			
KHARG No. 1	75,000	22.0	33.4	-
KUPAL No. 1	20,000	33.0	37.0	
LAB-E SAFID	30,000	34.7	-	-
LALI No. 1	25,000	35.3	35.0	-
MARUN	1,280,000	SE33.4 NW31.6	30.7	-
MARUN SE WHS	265,000			
No. 1	200,000			
No. 2	300,000			
No. 3	525,000			
M.I.S.	80,000	light	-	-
No. 8	40,000			
No. 9	40,000			
NAFT SARID NW	40,000	35.7	36.0	-
PARIS	495,000	34.1	-	-
WHS 1	345,000			
WHS 2	150,000			
PAR-E SIAH WHS 1	15,000	38.3	-	-
PAZANAN No. 1	75,000	35.8	-	-
RAG-E SAFID	295,000	28.6	26.0	
No. 1	175,000			
No. 2	120,000			
RAMIN No. 1	20,000	33.0	-	-
RAMSHIR No. 1	20,000	27.7	32.0	-
	7,295,000			

Table 10.6.

Well Productivity

Fields	1967 000 Bl/ Year oil produced	1967 No. of Wells	1967 Well/Year 000 Bl	1972 000 Bl/ Year oil produced	1972 No. of Wells	1972 Well/Year 000 Bl
Agha Jari/Karanj/ Marun/Paris	429,758	64	6,715	942,628	90	8,251
Gachsaran	242,621	24	10,109	315,183	29	10,868
Ahwaz	59,617	23	2,592	136,259	22	6,194
Haft Kel	28,025	10	2,802	16,381*	12	1,365
Bibi Hakimeh	83,199	17	4,894	159,462	14	11,390
Pazanan	20,418	3	6,806	6,620	2	3,310
Masjidi-Sulaiman/ Lali	12,857	29	443	3,277	19	172
Naft-Safid	7,920	15	528	11,531	12	961
Kharg	4,783	4	1,196	23,037	6	3,839
Ramshir	3,149	2	1,574	3,889	2	1,944
Rag-e-Safid	7,886	3	2,629	20,998	4	5,249
Binak	60,998	1	60,998	18,876	1	18,876
	961,231	195	4,929	1,658,141	213	7,785

* Includes Kupal production and wells.

Table 10.7.

Average Gravity

	1974	1973
Agha-Jari	34.11	34.04
Karanj Field	33.98	34.09
Marun Field	32.98	33.02
Paris Field	34.02	34.09
Pazanan Field	35.94	35.78
Central Area Fields	38.18	38.31
Ahwaz	31.91	32.18
Bibi Hakimeh	29.96	29.88
Binak	30.05	30.18
Gach Saran Field	31.31	31.37
Kharg Field	33.03	33.38
Mansuri	28.15	-
Rag-e-Safid	28.30	28.60
Ramshir	27.65	-
Kupal	32.31	32.86

Oil Service Co. of Iran.

APPENDIX 11

Products Price f.o.b. Bandar Mashur, British Petroleum, 1974

Products	U.S. ¢ per gallon[1]	U.S. $ p/bls[2]	Pattern of yields[3] %	Average Price p/bls
Aviation Gasoline			5.2	21.84
115/145	53	22.26		
100/130	51	21.42		
Motor Gasoline			12.2	15.83
97 R	40.2	16.88		
95 R	39.0	16.38		
93 R	38.0	15.96		
90 R	36.8	15.46		
83 R	34.5	14.49	11	14.91
Aviation Turbine Kerosine	35.5	14.91		
Kerosine	35.5	14.91	13	14.70
Premium	34.5	14.50		
Regular	31.5	13.23		
Gas Diesel Oils	31.0	13.02	1.6	12.83
48 Min.	-	12.55		
Industrial	-	12.50		
Marine	-	10.20		
Fuel Oil			57	10.97
Light Fuel Oil	-	9.90		
Medium Fuel Oil	30.5	12.80		
No. 2 Fuel Oil				
			100	13.08

1. Source: Petroleum Economist, 1975, p. 118.
2. Converted as one gallon equals 0.0238095 bls.
3. As average of 1965-75.

APPENDIX 12

Indexes for Conversion of Operating Costs into Constant Units of Money.

Year	Wage Index[1]	Capital Index[2]	Fuel Index[3]	Products[3]
1955	61.7	50.60	117.7	116.6
1956	67.1	62.50	117.7	116.6
1957	70.1	66.00	126.7	125.6
1958	70.8	67.20	126.7	125.6
1959	80.0	70.80	114.1	113.1
1960	86.3	71.80	117.7	116.6
1961	87.7	74.00	114.8	113.8
1962	88.5	71.80	113.0	114.0
1963	89.4	73.60	110.4	113.6
1964	93.3	74.20	110.4	104.6
1965	93.5	75.20	110.4	105.8
1966	94.3	80.40	110.4	103.6
1967	95.1	82.40	110.1	100.2
1968	96.6	90.70	108.3	100.2
1969	100.0	100.00	100.0	100.0
1970	101.5	105.40	99.8	115.2
1971	107.1	114.30	135.1	121.93
1972	113.8	121.80	149.2	153.2
1973	126.5	146.60	172.3	414.8
1974	143.7*	170.70	642.1	474.2
1975	161.0*	199.40	712.7	512.1

1. Converted to 1969 base year from Statistical Centre of Iran, Plan Organization, 1976 (2535).

2. Source, Chapter IV above.

3. Source: OPEC, Annual Statistical Bulletin, 1966-1975, Calculated on Bandar Mashur prices, and converted to 1969 base-year.
   The Indexes for 1955 through 1960 are based upon Iranian heavy crude prices f.o.b. Kharg Island, in the absence of prices for fuel and products proper.

* Estimated on the basis of implicit price deflators of GDP as: 1973 = 88, 1974 = 100, 1975 = 112 (Source: Bank-e Markazi, Iran).

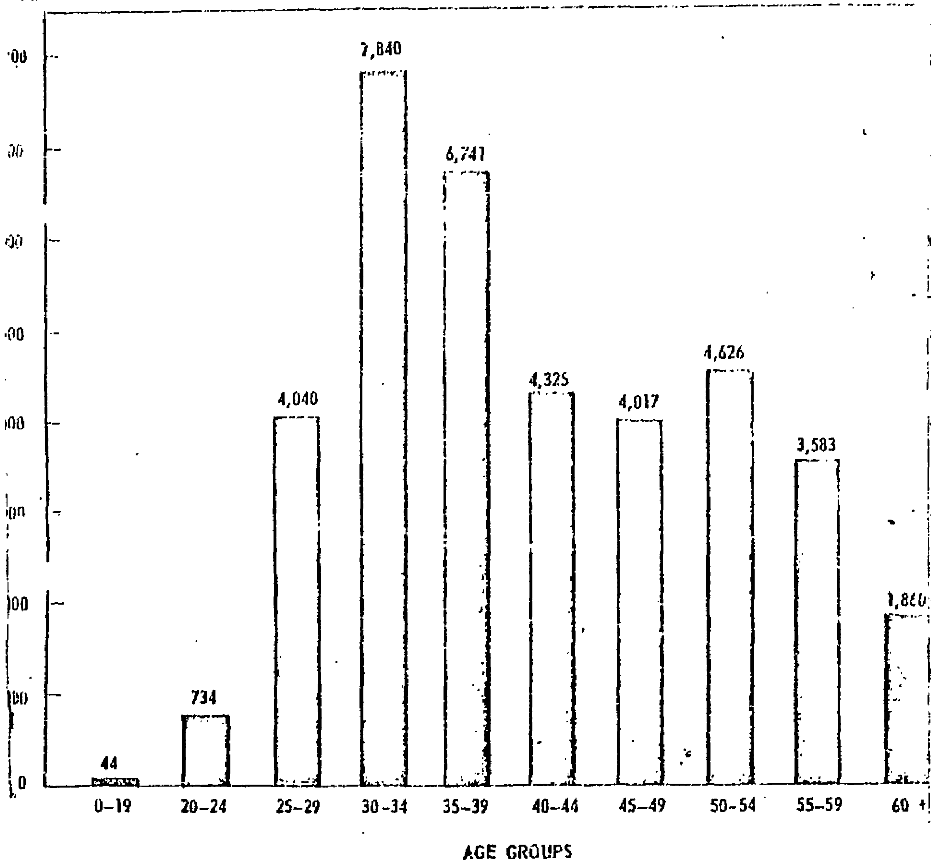
APPENDIX 13

1st January 1960

ESTIMATED AGE DISTRIBUTION OF LABOR

OPERATING COMPANIES & NICC NONBASICS

Total Labor = 37,810



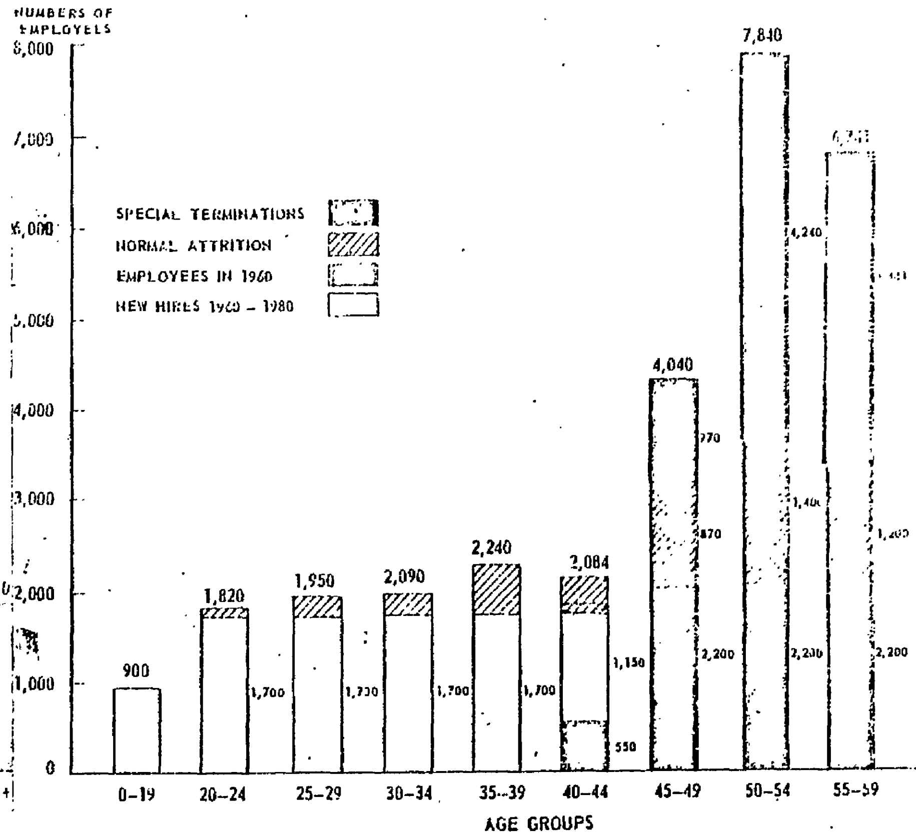
APPENDIX 14

1st January 1980

ESTIMATED AGE DISTRIBUTION OF LABOR

OPERATION COMPANIES & NIOC NONBASICS

Total Labor = 16,000



SOURCES AND BIBLIOGRAPHY

1. Primary Sources and Documents

Anglo-Persian Oil Company Ltd., Persian Concession, 1933-1993.

Bank-e Melli Iran, Balance Sheets, Tehran, 1954-1959.

Bank-e Markazi-e Iran, Annual Reports and Balance Sheet, 1960-1975.

__________, National Income of Iran 1959-1972.

Government of Persia, Concession of the Persian Government to Baron Reuter, July 25, 1872.

__________, Concession of the Persian Government to William Knox D'Arcy, Tehran, 1901.

Government of Iran, Oil Agreement, 1954.

House of Commons, Debates, Vol. 63, June 1914.

Iranian Oil Consortium, Supplemental Government Agreement, Tehran, January 9, 1965.

__________, Second Supplemental Agreement and Execution Letters, Tehran, May 28, 1967.

__________, Third Supplemental Agreement and Related Letters, Tehran, December 5, 1970.

__________, Letters Related to Supplemental Agreements (date?).

Iranian Oil Exploration and Producing Company, Accounts, 1955-1973.

__________, Comments on Accounts and Supporting Schedules, 1955-1973.

__________, Capital Expenditure Reports, 1955-1973.

__________, Exploration, Drilling & Production Programmes, and Capital Expenditure Budget, 1955-1973.

Iranian Oil Operating Companies, Annual Review, 1955-1973.

Iranian Oil Participants, Annexture to Supplemental Agreement, 1965, Attachment to Participants Note, November 16, 1966.

______________________, Treasury Department's Records, 1955-1975.

Iranian Oil Refining Company, Accounts, 1955-1973.

__________________________, Comments On Accounts and Supporting Schedules, 1955-1973.

__________________________, Capital Expenditure Reports, 1955-1973.

__________________________, Abadan, Manufacturing Programmes and Capital Expenditure Budget, 1955-1975.

Iranian Oil Services Company Ltd., (private company), Capital Expenditure Reports, 1973-1975.

______________________________, Exploration, Drilling & Production Programmes, 1974-1975.

______________________________, Reconciliation Reports, 1955-1975.

Majlis, Golshaian-Gas Supplemental Act, 26th Tir, 1328 (Persian).

______, Nationalization Act, 24-29 Esfand, 1329 (Persian).

______, Modifying Supplement to the Income Tax Law of 1328 (Persian).

Ministry of Customs & Monopolies; Customs Administration, Department of Statistics, Ministry of Economy, General Department of Trade Statistics and Ministry of Finance, Foreign Trade Statistics, 1955-1975 (all available issues).

Ministry of Economy, Iranian Customs Income, 1955-1975 (all available issues).

Ministry of Economy, General Department of Industrial and Mining Statistics, *Report of Industry and Mines Development in 1965*.

Ministry of Economy, *The Trend of Industrial Statistics* (date?).

__________________, *Time-Series of Mining Statistics in Iran, 1966*, Tehran 1968.

__________________, *Trends in Industrial and Commercial Statistics*, Tehran, 1969.

Ministry of Industries and Mines, *Development of Industry and Mines in Iran*, (1964?).

Ministry of Information, *Oil Documents* (Asnade Naft), 1330 (Persian).

Ministry of Interior, General Department of Public Statistics, *Report on the Industrial Census of Iran, August 1963, Series 1.3, Parts 1-23, Tehran 1963-1965*.

Ministry of Interior, Statistics Department, *Summary Results of Industrial Census,* Tehran, 1963.

Majlis, *Mozakerat-e Majlis, XLV*.

National Iranian Oil Company, *Capital Expenditure Budget Reports*, 1955-1975.

__________________________, *Project Advancement Reports*, 1955-1975 (all available copies).

__________________________, *Petroleum Act, Constitution of NIOC, and Service Contracts, 1353* (Persian and English).

__________________________, *Iran Oil Journal* (available copies).

__________________________, *Annual Review*, 1957-1975.

__________________________, *Sale and Purchase Agreement*, Tehran, July 31, 1973.

____________________________, Petroleum Act, August 6, 1974.

____________________________, A Short History and full texts of Persian Oil Agreements, Tehran, 1344 (in Persian).

NIOC, Abadan Refinery, Annual Capital Budget Report, 1973-1975.

Organization of Petroleum Exporting Countries (OPEC), Annual Statistical Bulletin, 1966-1975.

Plan and Budget Organization, A Report on the Second Seven-Year Development Plan, (date?).

____________________________, An Evaluation of the Third Development Plan, (date?).

____________________________, Fourth National Development Plan, 1967-1972.

____________________________, Introduction to the Third Development Plan of Iran, 1962-1966.

____________________________, Outline of the Third Plan, (date?).

____________________________, Review of Second Seven-Year Plan Progress, 1960.

____________________________, Review of the Third Plan Activities, Tehran, 1960.

____________________________, Second Seven-Year Development Plan of Iran, Tehran, 1956.

____________________________, Third Plan Frame, 2 vols.

Shahin, Input-Output Table for Iranian Economy, Ministry of Economy, Statistical Bureau, 1965.

United Nations, A System of National Accounts, Revised Version, 1968.

_______________, Commodity Index for the Standard International Trade Classification, Revised, Statistical Papers, Series M, No. 38, N.Y., 1963.

______________, Concepts and Definitions of Capital Formation, Statistical papers, Series F, No. 3, N.Y., 1953.

______________, International Standard Industrial Classification of All Economic Activities, Statistical papers, Series M, No. 4, Rev. 2, N.Y., 1968.

______________, Methods of National Income Estimation, Statistical papers, Series F, No. 8, N.Y., 1955.

______________, Indexes to the International Standard Industrial Classification of All Economic Activities, Statistical papers, Series M, No. 4, Rev. 2, Add. 1, 1971.

______________, International Trade Statistics, Statistical office, 1955-1974.

______________, Review of Economic Conditions in the Middle East, N.Y., 1951.

______________, Official Records of Security Council, Sixth Year, No. 560.

United States Senate, Multinational Corporations and United States Foreign Policy. Hearings Before the Sub-Committee on Multinational Corporations of the Committee on Foreign Relations - United States Senate - Ninety Third Congress, Second Session on Multinational Petroleum Companies and Foreign Policy, Vol. 1, 2, 7 and 8.

2. Secondary Sources

2.1 Articles and papers

Alejandro, Carlos F. Diaz, Industrialization and Labour Productivity Differentials, Review of Economics

& Statistics (Review), 1965, pp. 207-214.

Arrow, Kenneth, Chenery, Minhas and Solow, Capital Labour Substitution and Economic Efficiency, Review, 1961, pp. 225-247.

Barger, Harold, Embodied Versus Disembodied Improvements, Review, 1976, pp. 372-375.

Bargel, Yaram, Productivity in the Electric Power Industry, Review, 1963, pp. 395-408.

Bell, Frederick, W. A Note on the Empirical Estimation of the CES Production Function With the Use of Capital Data, Review, 1965, pp. 328-330.

Ben-Zion, Uri and Vernon W. Ruttan, Money in the Production Function, An Interpretation of Empirical Results, Review, 1975, pp. 246-247.

Bergson, Abram, Index Numbers and the Computation of Factor Productivity, Review of Income and Wealth, Series 21, 1975, pp. 259-278.

Berndt Ernst R, Reconciliating Alternative Estimates of the Elasticity of Substitution, Review of Econ. & Statistics, 1976, pp. 59-67.

Boddy, Raford and Gort, Michael, The Substitution of Capital for Capital, Review, 1971, pp. 179-188.

Bowman, M.J., Principles in the Valuation of Human Capital, Review of Income and Wealth, 1968, pp. 217-246.

Bowman, Raymond, T. and Phillips, Almarin, Conceptual and Statistical Problems in Estimating Capital Coefficients for Four Metal Fabricating Industries, The Problems of Capital Formation NBER, Vol. 19, 1957, pp. 347-374.

Brems, Hans, Growth Rates of Outputs, Labour Force, Hours and Productivity, Review, 1957, pp. 415-420.

Brown, Murray, A Measure of the Change in Relative Exploration of Capital and Labour, Review, 1966, pp. 182-192.

Brown, M. and Conrad, A., The Influence of Research and Education on CES Production Relations, in the theory and Empirical Analysis of Production, NBER 1967, pp. 341-389.

Brown, Murray and DeCani, John, S., A Measure of Technological Employment, Review, 1963, pp. 386-394.

Brown, M. and Popkin, Joel, A Measure of Technological Change and Increasing Returns to Scale, Review, 1962, pp. 402-411.

Brown, M. and Popkin, Joel, Reply to R.G. Gregory, A Measure of Technological Change and Returns to Scale, Review, 1965, pp. 454-457.

Brunel-Jailly I. and Silvestre J.J., A Production Model with Two Labour Inputs: A Comment, Review, 1971, pp. 288-289.

Burley, H.T., Production Functions for Australian Manufacturing Industries, Review, 1973, pp. 118-121.

Carter, Anne, P., Capital Coefficients as Economic Parameters: The Problem of Instability, The Problems of Capital Formation, NBER, Vol. 19, 1957, pp. 287-310.

Colitti, Marcello, Vertical Integration, Major Oil Companies and Newcomers: The Case of ENI, paper presented at St. Antony's College, Oxford, in Petroleum Seminar, chaired by Professor E. Penrose and R. Mabro, March 1976.

Creamer, Daniel, Measuring Capital Input for Total Factor Productivity Analysis: Comment by a sometime Estimator, Review of Income & Wealth, 1972, pp. 55-78.

Dacy, Douglas, C., Productivity and Price Trends in Construction since 1947, Review 1965, pp. 406-411.

Daly, D.J., Combining Inputs to Secure a Measure of Total Factor Input, Review of Income & Wealth, 1972, pp. 27-53.

Denison, E.F., Embodied Technical Change and Productivity in the United States, 1929-1958, Review, 1968, p. 291.

Dhrymes, Phoebus, J., A Comparison of Productivity Behaviour in Manufacturing and Service Industries, Review, 1963, pp. 64-69.

Dhrymes, Phoebus, J. and Zarembka, Paul, Elasticities of Substitution for Two-Digit Manufacturing Industries: A Correction, Review, 1970, pp. 115-117.

Dhrymes, Phoebus, J., Some Extensions and Tests for the CES Class of Production Functions, Review, 1965, pp. 357-366.

Dobell, Rodney, CES Production Function; A Symposium With Extensions and Comments, Review, 1968, pp. 443-460.

Doran, Alan, High-level Manpower, Prospects for LDC's, A paper presented at SOAS Development Seminars, May 30, 1977.

Douglas, Paul, H., Comments on the Cobb-Douglas Production Function, in The Theory and Empirical Analysis of Production, NBER, 1967, pp. 15-22.

EcKaus, R.S. and Lebefer, H., Capital Formation and Empirical Analysis, Review, 1962, pp. 113-122.

Eisner, R., Capital and Labour in Production: Some Direct Estimates, in The Theory and Empirical Analysis of Production, NBER, 1967, pp. 431-462, Comments 462-472.

Eisner, R., Components of Capital Expenditure: Replacement and Modernization Versus Expansion, Review, 1972, pp. 297-305.

Eisner, R. and Nadiri, M.I., Neoclassical Theory of Investment Behaviour, A Comment, Review, 1970, pp. 216-222.

Fair, Ray, C., Labour Force Participation, Wage Rates and Money Illusion, Review, 1971, pp. 164-168.

Ferguson, C.E., Cross-Section Production Functions and the Elasticity of Substitution in American Manufacturing Industry, Review, 1963, pp. 305-313.

Fisher, Franklin, M., Aggregate Production Functions and the Explanation of Wages: A Simulation Experiment, Review, 1971, pp. 305-325.

Frohn, Joachim, Estimation of CES Production Functions With Neutral Technical Change for Industrial Sector in the Federal Republic of Germany, 1958-1968, Review of Income & Wealth, 1972, pp. 185-199.

Fuchs, Victor, R., Capital-Labour Substitution, Review, 1963, pp. 436-438.

Gailard Hart, Albert, Capital Appreciation and the Accelerator, Review, 1965, pp. 123-136.

Gort, Michael, Systematic Errors in Budgetting Capital Outlays, Review, 1962, pp. 72-75.

Gort, Michael, and Boddy, R., Vintage Effects and the Time-Path of Investment in Production Relations, in The Theory and Empirical Analysis of Production, NBER, 1967, pp. 395-422.

Grant, Arthur, Issues In Distribution Theory: The Measurement of Labour's Relative Share, Review, 1963, pp. 273-279.

Gregory, R.G., A Measure of Technological Change and Returns to Scale: A Comment, Review, 1965, pp. 451-457.

Griliches, Z., Capital-Skill Complementarity, Review, 1969, pp. 465-468.

Griliches, Z., Production Functions in Manufacturing: Some Preliminary Results, in The Theory and Empirical Analysis of Production, NBER, 1967, pp. 275-320, Comments, 322-335.

Gustman, Alan, L., On the Appropriate Model for Analysing Investment in Human Capital, Review of Income & Wealth, 1973, pp. 303-305.

Haig, Bryan, The Treatment of Stock Appreciation in the Measurement of National Income. Review of Income & Wealth, 1973, pp. 429-436.

Harris, Davis, Hitch, Kerr and Fabricant, Productivity and Wages, Review, 1949, pp. 292-299

Hickman, Bert, G., Capacity, Capacity Utilization, and the Acceleration Principle, in the Problems of Capital Formation, NBER, Vol. 19, 1957, pp. 419-468.

Hicks, John, Elasticity of Substitution Again: Substitution and Complements, Oxford Economic papers, No. 3, November 1970, pp. 289-296.

Hodges, John, E., A Report on the Calculation of Capital Coefficients for the Petroleum Industry, in The Problems of Capital Formation, NBER, Vol. 19, 1957, pp. 375-388.

Hutcheson, Thomas, L., Factor Intensity Reversals and the CES Production Function, Review, 1969, pp. 468-470.

Intriligator, Michael, D., Embodied Technical Change and Productivity in the United States, 1929-1958, Review, 1965, pp. 55-60.

Iwand, Thomas, Models of Capital Accumulation and Economic Instability, Review, 1961, pp. 51-58.

Jasji, George, An Improved Way of Measuring Quality Change, Review, 1962, pp. 332-335.

Johnston, Robert, E., Technical Progress and Innovation, Oxford Economic papers, No. 2, July 1966, pp. 158-176.

Jong Keun You, Embodied and Disembodied Technical Progress in the United States, 1929-1968, Review, 1976, pp. 123-127.

Jorgenson, Dale, W. and Stephenson, James, A., The Time Structure of Investment Behaviour in U.S. Manufacturing, 1947-1960, Review, 1967, pp. 16-27.

Kaneda, Hiromitsu, Substitution of Labour and Non-Labour Inputs and Technical Change in Japenese Agriculture, Review, 1965, pp. 163-171.

Kendrick, John, W., The Treatment of Intangible Resources as Capital, Review of Income & Wealth, 1972, pp. 109-125.

Kennedy, Charles, The Death Rate of 'Tractors' and the Rate of Depreciation, Oxford Economic papers, No. 1, March 1973, pp. 57-59.

Komiya, Ryutaro, Technological Progress and the Production Function in the United States Power Industry, Review, 1962, pp. 156-166.

Kuh, Edwin, Cyclical and Secular Labour Productivity in the United States Manufacturing, Review, 1965, pp. 1-12.

Lawrence, J. Law, Profit Functions of Technologies With Multiple Inputs and Outputs, Review, 1972, pp. 281-288.

Latham, R.W. and Peel, D.A., Adjustment Costs and Short-run Returns to Labour, Review, 1974, pp.394-396.

Leibenstein, Harvey, Incremental Capital-Output Ratios and Growth Rates in the Short-run, Review, 1966, pp. 20-39.

Lithwick, N.H., Post, G. and Rymest, K., Post-war Production Relations in Canada, in The Theory and Empirical Analysis of Production, NBER, 1967, pp. 139-257, Comments, 258-271, Reply 271-273.

Marcus, Matityahu, Capital Labour Substitution Among States: Some Empirical Evidence, Review, 1964, pp. 434-437.

Mason, Hall, R., Some Observations on the Choice of Technology by Multinational Firms in Developing Countries, Review, 1973, pp. 349-355.

Massel. B., Capital Formation and Technological Change in U.S. Manufacturing, 1960, pp. 182-188.

Meyer, John and Kuh, Edwin, Acceleration and Related Theories of Investment: Am Empirical Inquiry, Review, 1955, pp. 217-230.

McCarthy, Michael, D., Embodied and Disembodied Technical Progress in the Constant Elasticity of Substitution Production Function, Review, 1965, pp. 71-75.

Miller, John Perry, The Pricing Effects of Accelerated Amortization, Review, 1952, pp. 10-17.

Mitchell, Edward J., Explaining the International Pattern of Labour Productivity and Wages: A Production Model with Two Labour Inputs, Review, 1968, pp. 461-469.

Moore, Frederick T., Capital Coefficients in Mineral and Metal Industries, in The Problems of Capital Formation, NBER, Vol. 19, 1957, pp. 311-345.

Moreh, J., Human Capital: Deterioration and Net Investment, Review of Income & Wealth, 1973, pp. 279-302.

Morrissett, Irving, A Note on the Empirical Study of Acceleration and Related Theories of Investment, Review, 1957, pp. 91-104.

Mundlak Yair and Razin Assaf, Aggregation, Index Numbers and the Measurement of Technical Change, Review, 1969, pp. 166-175.

Nakatani, Jwao, Production Functions with Variable Elasticity of Substitution (VES): A Comment, Review, 1973, pp. 394-396.

Neisser, H. and Grosswald, E., Gross Capital Stock and Net Capital Stock, Review; 1960, pp. 94-96.

Nelson, Richard R., Aggregate Production Function and Economic Growth Policy, in The Theory and Empirical Analysis of Production, NBER, 1967, pp. 479-499.

Nelson, Richard R., The CES Production Function and Economic Growth Projections, Review, 1965, pp. 326-330.

Nerlove, Marc, Recent Empirical Studies of the CES and Related Production Functions, in The Theory and Empirical Analysis of Production, NBER, 1967, pp. 55-119, Comments, pp. 122-133.

Nevin, Edward, The Life of Capital Assets: An Empirical Approach, Oxford Economic papers, No. 3, November 1963, pp. 228-243.

Newton, Walter L., Integration in the Tanker Industry, paper presented at St. Anthony's College, Oxford, in Petroleum Seminar, op. cit., February 17, 1976.

Nicoli, Alberto, Real Money Balances: An Omitted Variable from the Production Function? A Comment, Review, 1975, pp. 241-243.

Pasinetti, Luigi L., On Concepts and Measures of Changes in Productivity, Review, 1959, pp. 270-286.

Pederson, Peder J., Estimation of Aggregate CES Production Functions with the Use of Capital Data, Review, 1972, pp. 336-367.

Philpot, Gordon, Labour Quality, Returns to Scale and the Elasticity of Factor Substitution, Review, 1970, pp. 194.

Pietor de Wolff, The Depreciation Multiplier, Review, 1966, pp. 412-418.

Rrais, Zmira, Real Money Balances as a Variable in the Production Function, Review, 1975, pp. 243-244.

Praetz, Peter D., The Permissible Range of the CES Production Function, Review, 1968, pp. 287.

Resek, Robert A., Neutrality of Technical Progress, Review, 1963, pp. 55-63.

Rijckeghem, W. van, An Exact Method For Determining The Technology Matrix in a Situation With Secondary Products, Review, 1967, pp. 607-608.

Ringstad, V. and Griliches, Z., A Method of Analysing the Consistency of the Series for Capital and Investment, Review of Income & Wealth, 1968, pp. 411-414.

Rosenberg, Nathah, Capital Goods, Technology and Economic Growth, Oxford, Economic Papers, No. 3, November 1963, pp. 217-227.

Ryan, Terencem, CES Production Functions in British Manufacturing Industry: A Cross Section Study. Oxford

Economic papers, No. 2, July 1973, pp. 241-250.

Rymes, T.K., The Measurement of Capital and Total Factor Productivity in the Context of the Cambridge theory of Capital, Review of Income & Wealth, 1972, pp. 79-108.

Ryuzo Sato and Hoffman, Ronald F., Production Functions With Variable Elasticity of Factor Substitution: Some Analysis and Testing, Review, 1968, pp. 453-460.

Ryugo Sato and Tetsunori Korzumi, On Elasticities of Substitution and Complementarity, Oxford Economic papers, No. 1, March 1973, pp. 44-56.

Schitt, Eric, Gross Stocks Estimated from Past Installations, Review, 1958, pp. 174-177.

Shaikh, Anwar, Laws of Production and Laws of Algebra: The Humbug Production Function, Review, 1974, pp. 115-120, Comment, p. 121.

Shaw, Lawrence H. and Arden, Robert S., Output Effects of a Changing Composition of Industry, 1947-1965, Review, 1968, pp. 134-136.

Shen, T.Y., Innovation, Diffusion and Productivity Changes, Review, 1961, pp. 175-181.

Sinai, Allen and Houston H. Stokes, Real Money Balances: An Omitted Variable from the Production Function, Review, 1972, pp. 290-296.

Sinai, Allen and Houston H. Stokes, Real Money Balances: An Omitted Variable from the Production Function? A Reply, Review, 1975, pp. 247-252.

Solow, R., Some Recent Developments in the Theory of Production in the Theory and Empirical Analysis of Production, NBER, 1967, pp. 25-48.

Solow, R.M., Technical Change and the Aggregate Production Function, Review, 1957, pp. 312-320.

Soskice, Davis, A Modification of the CES Production Function To Allow for Changing Returns to Scale over Function, Review, 1968, pp. 446-448.

Supel, Thomas and Sher Garson, A Note on the Asymtotes of the CES Production Function in the Case where $\delta<1$, Review, 1970, pp. 337-339.

Tachibanaki, Toshiaki, Quality Change in Labour Input: Japanese Manufacturing, Review, 1976, pp. 293-299.

Tice, H.S., Depreciation, Obsolescence and the Measurement of the Aggregate Capital Stock of the United States, 1900-1962, Review of Income & Wealth, 1967, pp. 119-154.

Tobin, James, Comment on Solow's 'Some Recent Developments in the Theory of Production, in The Theory and Empirical Analysis of Production, NBER, 1967, pp. 50-53.

Tsurumi Hiroki, Non-Linear Two-Stage Least Square Estimation of CES Production Functions Applied to the Canadian Manufacturing Industries, 1926-1939, 1946-1967, Review, 1970, pp. 200-207.

Waldorf, William H., Labour Productivity in Food Wholesaling and Retailing, 1929-1958, Review, 1966, pp. 88-93.

Waldorf, William H., Quality of Labour in Manufacturing, Review, 1973, pp. 284-290.

Walters, A.A., A Note on Economics of Scale, Review, 1963, pp. 425-426.

Westfield, Fred M., Technical Progress and Returns to Scale, Review, 1966, pp. 432-441.

Wickens, Michael M., Estimation of the Vintage Cobb-Douglas Production Function for the United States, 1900-1960, Review, 1970, pp. 187-193.

Wykott, Frank C., Capital Depreciation in the Post-War Period: Automobiles, Review, 1970, pp. 168-172.

Yao Chilu and Lehman B. Fletcher, A Generalization of the CES Production Function, Review, 1968, pp. 449-452.

Zarembka Paul and Chernicott, Helen B., Further Results on the Empirical Relevance of the CES Production Function, Review, 1971, pp. 106-110.

Zarembka, Paul, On the Empirical Relevance of the CES Production Function, Review, 1970, pp.47-53.

2.2 Secondary Sources: Books

Ahari, H., Oil Agreements, Oil Price and Revenues (Gharardad-haye Nafti, Gheimat va daramade Naft) Tehran, 1349, (in Persian).

Arps, J.J., Economics of Petroleum Exploration, Development and property Evaluation, Dallas, Texas, 1961.

Arsanjani, H., Political Notes on 30th Tir 1331, Yaddashthaye Siasi) Tehran, Bamshad, 1335 (in Persian).

Assad Baik, Oil and Blood in the East, (Naft va Khun dar Shargh) 1950, Trans. M.H., Jahanbani, Tehran, 1329.

Bayne, E.A., Persian Horizons: A Survey of Contemporary Social, Economic and Political Trends in Iran, N.Y., 1960.

Benedict, R.E., Industrial Finance in Iran, Boston, 1964.

Bharier, J., Capital Formation in Iran, 1900-1965, University of London, unpublished, Ph.D. thesis.

__________, Economic Development in Iran, 1900-1970, London, 1971.

Bonbright, J.C., Valuation of Property, N.Y., McGraw-Hill, 1957.

Brooks, Michael, Oil and Foreign Policy, London, 1949.

Bradly, Paul G., The Economics of Crude Petroleum Production, Amsterdam, 1967.

Cambell, John M., Oil Property Evaluation, 1959.

Cassady, Ralph Jr., Price Making and Price Behaviour in the Petroleum Industry, N.Y., 1954, 1973.

Chase Manhattan Bank, Capital Investments in the World Petroleum Industry, N.Y., 1974.

____________________, Investment Patterns in the World Petroleum Industry, N.Y., 1956.

Chazeau, Melvin de and Alfred Kahn, Integration and Competition in the Petroleum Industry, N.Y., 1959.

Creamer, D., Dobrovolsky, S.P. and Bernstein, Capital in Manufacturing & Mining: Its Formation & Financing, NBER, 1960, Princeton University.

Denison, E., Why Growth Rates Differ: Post-War Experience in Nine Western Countries, Washington D.C., Brookings Institute, 1967.

Engler, Robert, The Politics of Oil: A Study of Private Power and Democratic Directions, Chicago, 1967.

________________, Oil and Bahrain; Abbas Eskandari in the Fifteenth Parliament, Tehran, Eqbali publication, 1331 (in Persian).

Fateh, M., Fifty Years of Iranian Oil, (Panjah Sal Nafte Iran), Tehran, Chehr, 1335 (in Persian).

Fatemi, N.S., Oil Diplomacy: Powder Keg in Iran, New York, 1954.

Feinstein, C.H., Domestic Capital Formation in the United Kingdom, 1920-1938, Cambridge 1965.

Frank, Helmet, J., Crude Oil Prices in the Middle East, N.Y., Washington, London: Praeger, 1966.

Frankel, P.H., Essentials of Petroleum; A Key to Oil Economics, London, 1969.

Ghasemzadeh, M., Economics of Iranian Oil: An Analysis and Economic Comparison of the 1954 Agreement with 1933 Oil Concession (Iqtisade Nafte Iran, ...) Tehran, 1347 (in Persian).

Ghosh, S.K., Anglo-Iranian Oil Dispute, Firma K.L. Mukhopadhyay, India, 1960.

Graham, W.J. and Hetherington, E., Effects of Production Restriction on Iranian Oil.

Grant, E.L., Norton, P.T., Depreciation, N.Y., 1949.

Hartshorn, J.E., Oil Companies and Governments: An Account of the International Oil Industry in its political Environment, London, 1962.

_______________, Politics and World Oil Economics, London, 1967.

Hatfield, H.K., Accounting, N.Y., Appleton, 1931.

Issawi, Yeganeh, The Economics of Middle Eastern Oil, London, 1962.

Keyhan, Texts of speeches of four senators disputing Oil Agreement of 1954, (Matn-e Kamel-e Notqhaye Aghayane Senator Lesani, Divan Beiky, Sharif-Emami, Dr. Hesabi, dar Radde gharardade Naft ba Consortium: Amini-page), Senate House, Tehran, 1333.

Leeman, A. Wayne, The Price of Middle East Oil, Cornell University Press, 1962.

Lenczowsky, George, Oil and State in the Middle East, N.Y. 1960.

Longrigg, Stephen Hemsley, Oil in the Middle East: Its Discovery and Development, London, 1968.

Looney, Robert, E., The Economic Development of Iran: A Recent Survey with Projection to 1981, Praeger publishers, 1973.

Manaharan, The Oil Crisis: End of an Era, India, 1974.

Mansoori, Naraghi, M., The Legal Basis and General Conditions of Middle Eastern Oil Agreements, (Mabanie Hoghooghi va Sharaete omoomie gharardadhaye Naftie Khavare Mianeh), Tehran, 1351.

Mikdashi, Zuhair, A Financial Analysis of Middle Eastern Oil Concessions, 1901-1965, N.Y., 1966.

Pogue, J. and Coqueron, F.G., Capital Employed in the Petroleum Industry, in Our Oil Resources, Ed. Leonard Fanning, McGraw-Hill, 1945.

Monroe, E., Britain's Moment in the Middle East, 1914-1956, London, 1965.

Movahed, M., Our Oil and its Legal Problems, (Nafte Ma va Masaele Hoghoghie An, Tehran), Kharazmi, 1349.

Nahai, Lotfollah, The Petroleum Industry of Iran, 1963.

O.E.C.D., Manual of Industrial Project Appraisal, 1968.

Penrose, Edith T., The Growth of Firms, Middle East Oil and other Essays, London, 1971.

________________, The International Oil Industry in the Middle East, London, 1968.

________________, The Large International Firm in Developing Countries, London, 1968.

Porter, M., Petroleum Accounting Practices, N.Y., 1966.

Radwan, Samir M., Capital Formation in Egyptian Industry and Agriculture, University of London, unpublished Ph.D. thesis, 1973.

Rouhani, F., History of the Nationalization of Iranian Oil Industry, (Tarikhe Melli Shodane Sanāte Nafte Iran), Tehran, 1352.

Shwadran, B., The Middle East Oil and the Great Powers, N.Y., 1959.

Stocking, G.W., Middle East Oil: A Study in Political and Economic Controversy, Vanderbilt University Press, 1970.

Sutton, E.L.P., Persian Oil: A Study in Power Politics, London, 1955.

Tahir, A.H., Income Determination in the International Petroleum Industry, Pergamon Press, 1966.

Tahmasbi, H., Impact of Collective Bargaining, unpublished thesis (1972?).

U.S. Senate, War-time Petroleum Policy Under the Petroleum Administration for War, Hearings (Washington, 1946).

U.S. Treasury Department, Bureau of International Revenue, Bulletin F, Income Tax Depreciation and Obsolescence - Estimated Useful Lives and Depreciation Rates, revised January 1942.

______________________, Income Tax Depreciation and Obsolescence of New Properties, 1942.

Vernon, R. (ed), Energy Crisis, N.Y., 1975.

3. Tertiary Sources

Amuzegar and Fekrat, Iran: Economic Development Under Dualistic Conditions, Chicago, 1971.

Amuzegar, J., Technical Assistance in Theory and Practice - The Case of Iran, N.Y., 1966.

Baldwin, G.B., Planning and Development in Iran, 1967.

__________, Iran's Experience With Manpower Planning: Concepts, Techniques & Lessons, in Harbison and Myers' Manpower and Education, N.Y., 1965.

Buckley, Stuart E. (ed) Petroleum Conservation, Dallas, Texas, American Institute of Mining and Metalurgical Engineers, 1951.

Churchill, Winston, The World Crisis, 1911-1918, 4 vols., London, 1938.

Curzon, Persia and the Persian Question, London, 1892.

Davoodi, D., A Secret War for Oil (Janghe Makhfi Baraye Naft), Tehran, 1326.

Donaldson, Lufkin, The International Oil Industry, 1966.

Essed Bey, M. and Brandon, Paul Maeker, Reza Shah, London 1938.

Eradeye Azarbaijan, The Oil Turmoil, Black Political Omens (Ghoghaye Naft, Pishbinihaye Talkhe Siasi), (date?).

Fatemi, A Diplomatic History of Persia, N.Y., 1952.

Fellner, William A., Competition Among the Few, Oligopoly and Similar Market Structure, N.Y., 1949.

Fesharaky, Fereidun, The Development of Iranian Oil Industry, University of Guildford, Surrey, unpublished Ph.D. thesis, 1973.

Foroozan, M., Is there an Economic Justification for Under-lifting of Iranian Oil? (Aya Baraye Kam Bahreh-bardari as Nafte Iran, Tojihe Eqtesadi Vujood darad?) Tehran, Tahqiqate Iqtisadi, (1969?).

__________, Oil Economics, An Enquiry into Factors Determining Crude Prices (Iqtisade Naft: Tahqiq dar avamele Taaien Konandeye Qimate Nafte Kham ...), Tehran, 1342.

__________, Oil Agreement Profitability Comparisons, Iran Oil Journal, April 1969.

Foroozan, Staufer, Mina, Erfani, Bahsi dar bareye Ar yabye Tatbighye gharardadhaye Nafti ... Tahqiqate Iqtisadi Tehran, Nos. 21-22, 1349.

Frankel, P.H., Matter: Oil and Power Politics, 1966.

Ghadimi, Z., A History of Iran's Oil Revolution (Tarikhe Enghelabe Nafe Iran), Tehran, 1322.

Hashim, Jawad, Capital Formation in Iraq, L.S.E., 1965, unpublished Ph.D. thesis.

Hibbert, J., Modern Practices and Conventions in Measuring Capital Formation in the National Accounts, in Higgins J.P.P., Pollard S. and Ginarlis, J.E. Aspects of Capital Investment in Great Britain, 1750-1850, London, 1971.

Hicks, John, Capital and Time, Oxford University Press, London, 1973.

Hirst, David, Oil and Public Opinion in the Middle East, London, 1966.

Hooley, The Measurement of Capital Formation in Under-Developed Countries, Review, 1967, pp. 201-206.

International Labour Office, Labour Conditions in the Oil Industry in Iran, Geneva, 1950.

Kuznets, Simon, Capital in the American Economy, its Formation and Financing, Princeton, 1961.

Lenczowski, G., Russians and the West in Iran, 1918-1946, A Study in Power Rivalry, 1949.

Longhurst, Henry, Adventures in Oil (the story of British Petroleum), London, 1959.

Lubell, H., Middle East Oil Crisis and Western Europe's Energy Supplies, 1962.

Mabro, Robert, The Egyptian Economy, 1952-1972, Oxford, 1971.

Makki, Hossein, Twenty Years of Iran's History (Tarikhe Bist Saleye' Iran), Tehran, (2 vols.).

Miksell, R. (ed), Foreign Investment In the Petroleum and Mineral Industries, Baltimore, 1971.

Mustafa, Oil Negotiations, A View from Iran, Columbia Journal of World Business, 1971.

National Bureau of Economic Research, Price Research in the Steel and Petroleum Industries, N.Y., 1939.

Nahai and Kemble, Petroleum Industry in Iran, Bureau of Mines, U.S. Department of Interior, 1963.

Nash, Gerald, D., United States Oil Policy, (1890-1964), 1968.

Nielson, Robert, Oil Tanker Economics, Bremen, 1959.

Norman, Kemp, Abadon: A First Hand Account of the Persian Oil Crisis, London, 1953.

O'Connor, Richard, The Oil Barrons: Men of Greed and Grandeur, 1971.

O'Connor, Harvey, World Crises in Oil, N.Y., 1962.

Rachkov, Boris, Oil, Nationalism and Imperialism, New Delhi, 1932.

Robinson, Joan, The Accumulation of Capital, MacMillan and Co. Ltd., 1969.

Sanders, T.H., Hatfield, H.R. and Moore, A Statement of Principles, American Institute of Accounts, 1938.

Shahan, Michael Kahi, Iran: The Impact of United States Interests and Policies, 1941-1954.

Shahan, A.S., A Study on Iranian Economic Development, 1941-1965, Tehran (1966?).

Smith, Adam, An Inquiry into the Nature and Causes of the Wealth of Nations, London, 1937, ed.

Stanford Research Institute, Long-Term Future Energy Policy in Iran - A Report to the Government of Iran, 1969.

Tanzer, Michael, The Political Economy of International Oil and the Underdeveloped Countries, 1962.

Tomas, Lewis Victor, The United States and Turkey and Iran, 1914-1965, 1971.

Tugendhat, Christopher, Oil the Biggest Business, 1968.

Williamson, J.W., In a Persian Oil Field, London, 2nd ed., 1928.

Zimmerman, Erich W., Conservation in the Production of Petroleum, Yale, 1957.

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GENERAL INFORMATION

PRODUCING, REFINING AND EXPORTING AREAS

1976 EDITION

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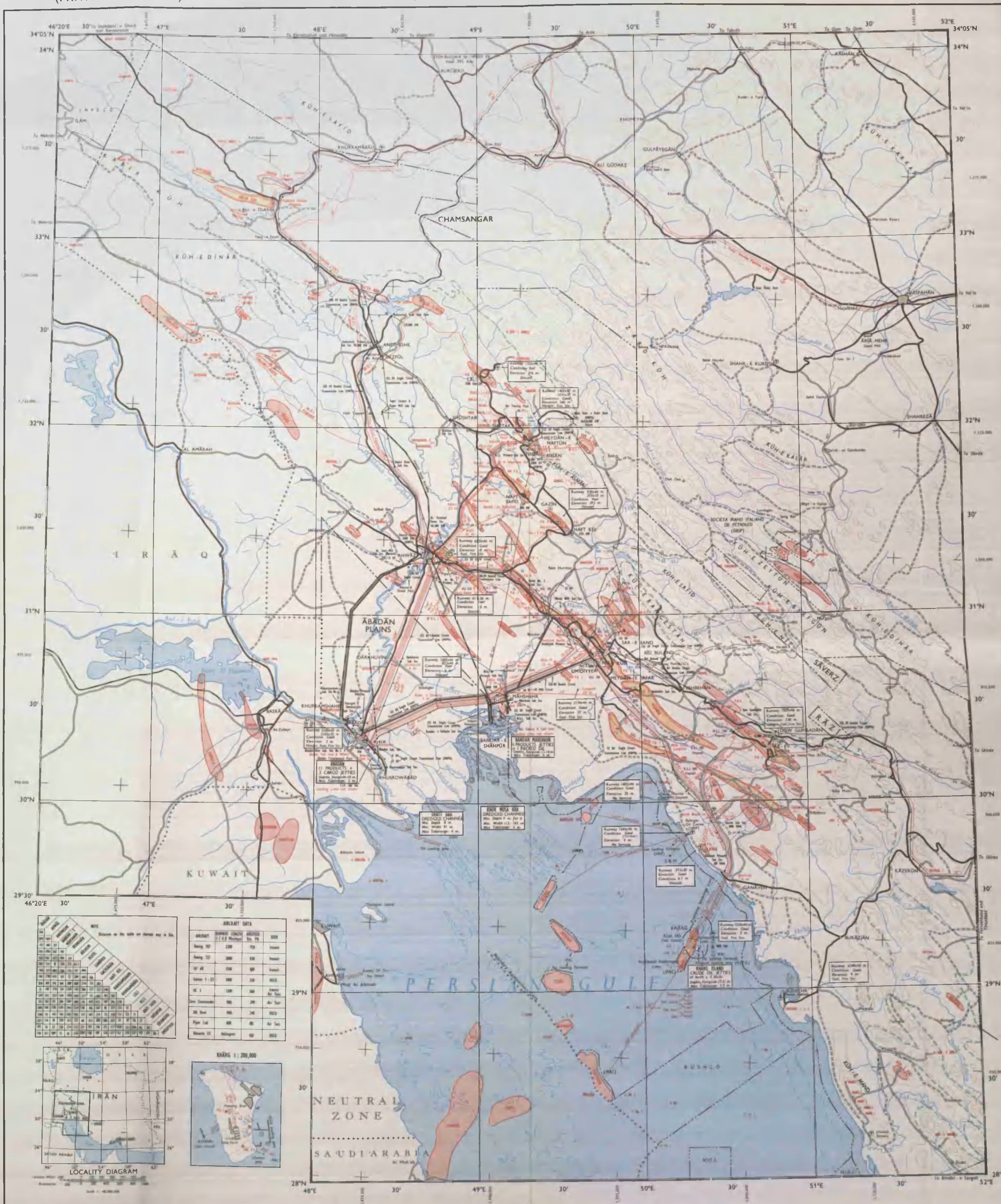

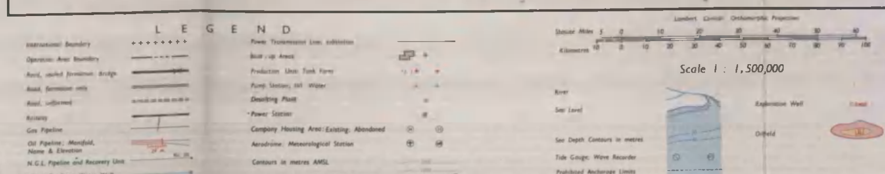

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COMPILATION

This map has been compiled by General Survey, OSCO Tehran from the latest available information from various sources, as on 28th December 1975, and supersedes all previous editions.

Land elevations and contours are in metres above mean sea level. Depths are the effective minimum depths below chart datum at each locality.

For more detailed marine data, refer to port information Booklets issued by OSCO for Bandar Māhshahr and Khārg.

NOTE:

1. This map is not an authority on International or Operation Area Boundaries.
2. Oil Fields Data and Production Unit Data available as Supplement to this map

Oil Service Company of Iran

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